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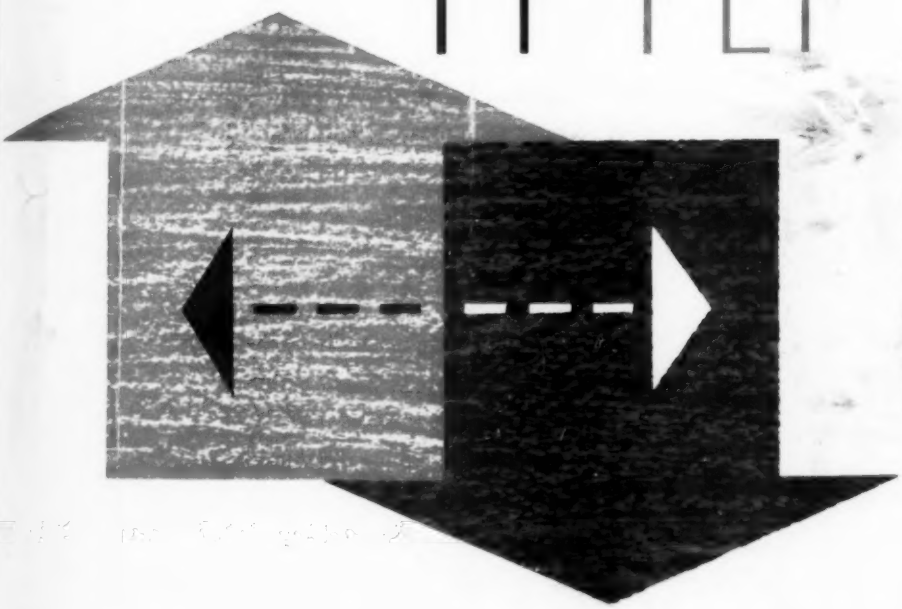

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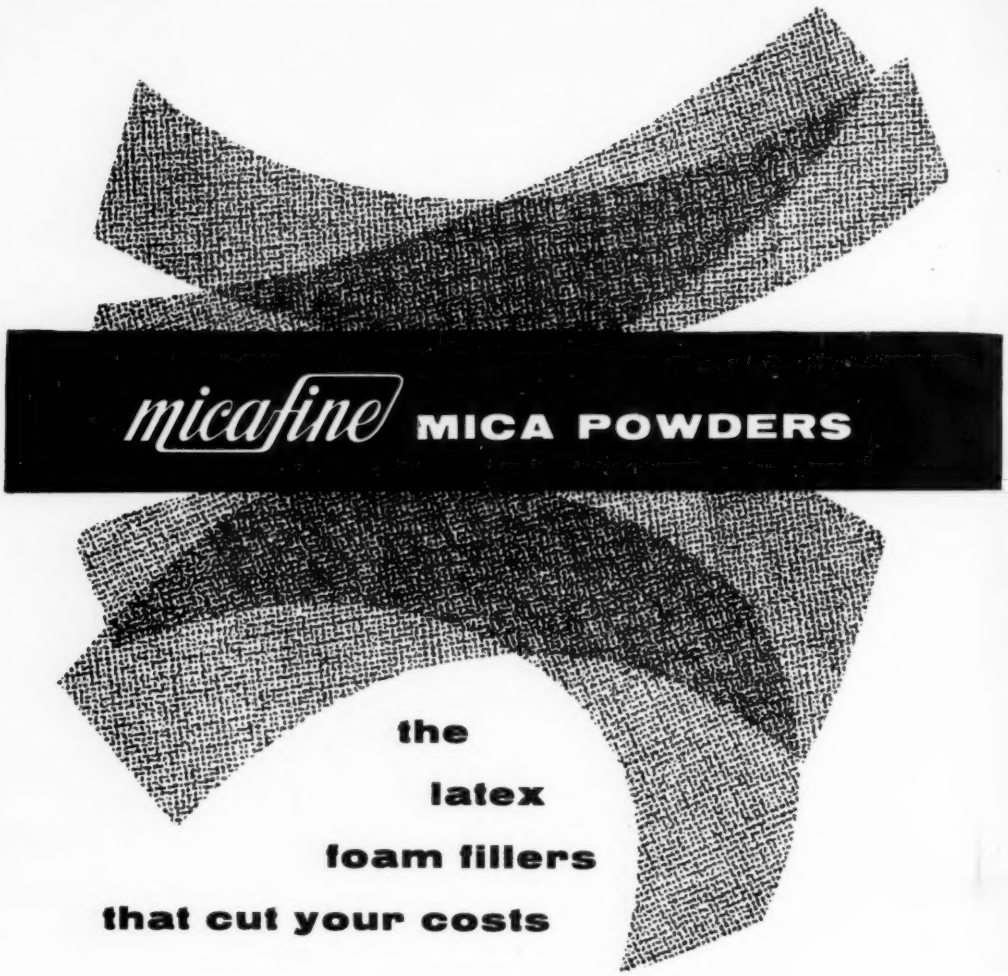

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IN ITS 75th YEAR

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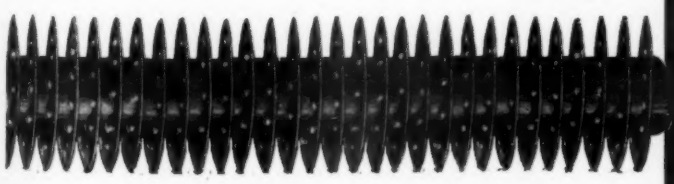

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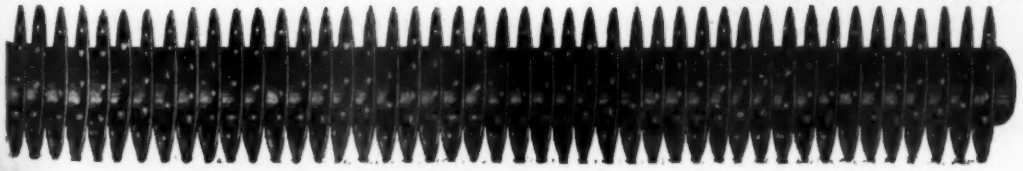

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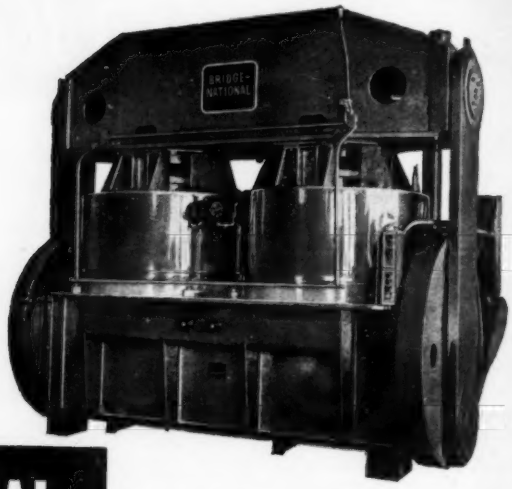

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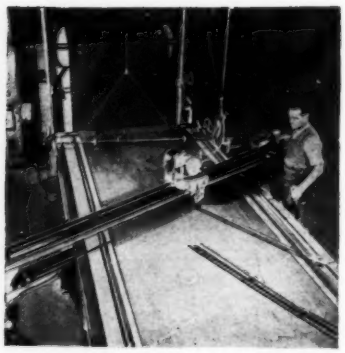

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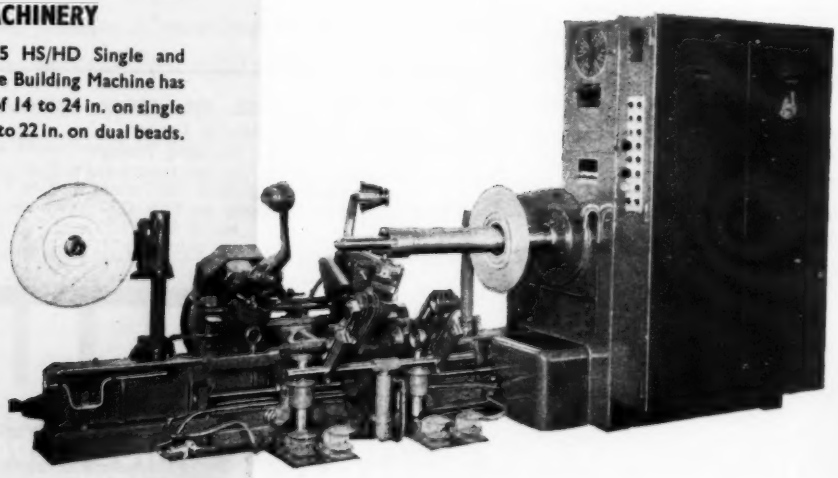

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NOTES of the WEEK

Protecting Builders

IT has been said before, unhappily with little or no effect, that we are the most un-weather-conscious nation on earth. Each winter sees us caught unprepared; by fog, against which we put up the most pathetic of defences—indeed, the first men to fly to the moon may well take off from a fog-shrouded launching pad; or sitting in draughty rooms from which heat escapes through single glazing or up gaping chimneys in prodigal quantities of BTUs. In these respects, things are improving surely if slowly. Not so, however, in a matter of great importance and one for which the remedy is simple. The number of unemployed in the country is put officially at more than 600,000. A considerable proportion of this figure is said to consist of men in the building industry who have been unable to work because of the recent weather conditions. It is high time that the building industry, more than merely inclined to be conservative, should wake up to modern methods which make it possible for work on buildings to go on regardless of the weather. In Canada and the United States, polythene film has been used for several years past to provide side and top screens against wind and weather. In effect, the film is wrapped around the growing building and enables operations to continue even in conditions of snow and ice.

Research Expenditure

EXPENDITURE by manufacturing industry on research is the subject of a recent report issued by the Department of Scientific and Industrial Research. Although the year covered is 1955, the present position probably does not differ greatly if considered proportionately. Expenditure is, of course, higher and more are employed. The definition of research and development caused the writers of the report some trouble for in many cases it was difficult to differentiate between research, development and regular work. In the end, research and development were taken to include applied research on new and different raw materials, methods, machinery and prototype production. Industry is quoted as having spent £183m in its own establishments in the year surveyed, with a further £9m spent by research associations and DSIR stations. Combined, the sum was equivalent to about 12% of the net profits of all manufacturing companies. However, of the total, more than 40% was spent by the aircraft industry; of the remainder, the only significant contributions came from the engineering and chemical industries. Staff employed on research totalled 130,000, distribution conforming roughly to the sums of expenditure. At the end of last year it was announced that DSIR's second five-year plan, for the period 1959-64, envisaged the spending of £61m by the Department in that time on research. That is very nearly double the Department's expenditure during the first quinquennium which ends on March 31 this year. As for industry's share in research, this must inevitably rise as manufacturers seek for ever wider markets and in so doing demand not only more and more new materials but an increased knowledge of those now existing. If it is far-sighted to support industry research associations, and many believe this to be no more than sound common sense, it follows that it is short-sighted not to; and this must be true even for the smallest of companies.

I.R.I.S.A.

MASSIVE replanting schedules, the establishment of new plantations and synthetic rubber plants as well as, on the industrial side, new and wider uses in many fields, point the continuing power of the rubber industry. The fact that, even in so well established an industry, interest goes on growing—as does awareness of the need for keeping in touch with fast-moving technical developments—is underlined by the steps taken recently in South Africa (reported earlier in *RJIP*) to set up a South African section of the Institution of the Rubber Industry. The new section, which is to have a central council in Johannesburg with branches in that city, Durban and Port Elizabeth, is to work to promote the development of polymer science and technology; to encourage technical education and to provide a means of association between those engaged in the rubber industry. There is, of course, already an Australasian section, set up 14 years ago, and an Indian section of the I.R.I. Such expansion by the world's foremost rubber industry organization is all to the good, for world economy is undoubtedly and rapidly expanding and the demand for rubber and rubber manufactures is likely to be greater than is even now realized.

Tourism Up to Date

AN economic report on Lebanon issued last week by the Board of Trade contained the following item, which we print without comment, on the tourist industry: 'Due to the five months of disturbances, 1958 has been a bad year in so far as tourism is concerned. One source of revenue, however, was the landing of United States Forces on July 15 and their stay here until October 31, which, it is estimated, produced 3½-4 million dollars. United Nations observers were another source of revenue: it is estimated that their stay here (July-November) produced over 1 million dollars.'

NEWS *Briefs*

ITALIAN PETROCHEMICAL PLANT — SPANISH PLASTICS — US TREAD RUBBER — PLANTATION FOR NIGERIA — BRUSSELS LIAISON OFFICE

●**United States**—Plans for the construction of a new industrial plant for the manufacture of tread rubber at Paris, Texas, have been announced by James H. Hoffman, president of Mansfield Tire and Rubber Company.

●**Indonesia**—Both Russia and China bought more rubber from Indonesia last year than in 1957, according to officials of the Foreign Trade Ministry. Figures for the whole year are not yet known. It was pointed out that during the first ten months of 1958 China bought 50,311 tons compared with 36,384 in the same period of the year before, while Russia bought 17,276 tons compared with 3,668 tons.

●**Australia**—B. F. Goodrich Australia Pty. Ltd. has announced that it will begin producing tyres in January next year, two months ahead of schedule.

●**France**—The Montecatini Company has concluded an agreement for the manufacture, under licence, in France of its polypropylene derivative, Moplen. Two French companies, Péchiney and the Société Normandie de Matiers Plastiques are to undertake production in France, which is expected to rise to 10,000 tons per annum in the first stage.

●**Nigeria**—Tyres were exhibited on several stands in the trade and industry exhibition at the recent Festival of Kano in Northern Nigeria. Dunlop and Goodyear were shown by the motor division of the United Africa Co. Ltd., Firestone by Union Trading Co. Ltd., and Henley by K. Chellaram and Sons Ltd. Odutola Tyresoles Ltd., the Kano retreading factory, had their own stand.

●**Italy**—The Montecatini Chemical Company is to build one of Europe's largest petrochemical plants. Investment is to be £34m., and construction is to start this month. The plant, to be built at Brindisi, will produce the entire range of derivatives of liquid hydro carbons and is scheduled to start production in 1960.

●**United States** — The AFL-CIO United Rubber Workers' Union in the US has completed the formalities of putting the 'Big Four' rubber companies on notice for upcoming contract negotiations, Reuter reports. The Union has already served contract reopening notices on Goodyear Tire and Rubber Company, B. F. Goodrich Company and Firestone Tire and Rubber Company. Recently, the URW gave notice to United States Rubber Company. The US Rubber contract runs out April 9, while the Goodyear, Goodrich and Firestone deadlines are April 15.

●**Belgium**—It has been announced in Milan that Belgian, French, Dutch, German and Italian rubber associations have opened a liaison office in Brussels which will co-ordinate rubber industry activities within the framework of the European Economic Community. The office is titled 'Bureau de Liaison des Industries du Caoutchouc da le Communaute Economique Europeene (BLIC)—European Economic Community's Rubber Industries' Liaison Bureau. Herr Wilhelm Kaiser, of Germany, has been elected chairman of the Bureau.

●**Spain** — 50% foreign participation in the Spanish firm 'Resinas Artificiales Viladecans, SA' by the Dutch company N. V. Chemische Industrie, which will provide patents and technical knowledge as well as capital, has been given official approval in Spain.

●**South Vietnam**—It is reported that the Michelin Rubber Co. intends to establish a factory for the production of tyres and tubes for bicycles, motor cycles and scooters. Production may eventually include larger tyres for vehicles.

●**Nigeria** — The Western Nigeria Prime Minister has announced that a rubber plantation is to be established in the Remo division at a cost of about £900,000, by the Western Region Production Development Board.

●**European Economic Community**—Rubber manufacturers of the Common Market countries have created a liaison committee among themselves, it was announced this week. The committee will co-ordinate the work of the trade associations in each of the Six countries. The first chairman will be Herr F. W. Kaiser (Germany) with Signor E. Solcia (Italy), vice-chairman. Headquarters are to be provisionally in Brussels.

'It reports progressively if your weight increases—"bottom limit, middle limit" or "top limit," and if you go any higher it'll scream blue murder and yell "YOU'RE FIRED!"'—427

Composition of Vulcanized Rubber*

INFLUENCE ON FATIGUE PROPERTIES

IN solid and pneumatic tyres, in various dampers, couplings and many other articles, vulcanized rubber is functioning in conditions of repeated cyclic deformation. In a number of other cases (gaskets and the like) the rubber is subjected to continuous action of static loads. In all these cases the most important factor in the serviceability of the rubber is its capacitly for withstanding mechanical action over a long period. This quality, which may be called the resistance to fatigue (dynamic or static, according to the nature of the loads applied) or according to widely used but not strictly accurate terminology, the fatigue strength, has recently been attracting the close attention of many investigators. The results of a large number of studies in this field are summarized in a monograph by Dillon[1] and in a survey article[2] which is appended to its Russian translation.

Basic Factors

The present paper is devoted to the study of the dependence of the resistance of vulcanized rubbers to fatigue upon the basic factors of the degree of vulcanization, of filling and of plasticization.

Before actually discussing the material let us consider briefly some questions of terminology and testing procedure.

The terminology in this field is in many cases quite confused and ill-founded. Thus, for instance, to denote the number of cycles up to the breaking of the rubber, different authors use the terms work capacity, durability, fatigue endurance and fatigue strength. A similar uncertainty prevails in English literature, where the term 'fatigue life' is used to denote not only the time but also the number of cycles to breaking. In a special article[3] devoted to problems of procedure in fatigue testing of vulcanized rubbers we put forward a rational terminology, which we have used in the present communication. Thus, the number of cycles up to destruction of a vulcanized rubber with a given pattern of dynamic loading will be designated as 'work capacity,' and the amplitude of stress causing destruction of the material after a given number of cycles (*i.e.* corresponding to the applied 'work capacity') will be called the 'fatigue strength' or the 'fatigue tensile strength.' For the amplitude of the deformation and the energy of the cycle corresponding to a given work capacity, we introduce the terms 'fatigue deformation' and 'fatigue energy of tearing.'

The fact that the fatigue testing of rubber is usually carried out with fairly large deformations gives rise to a number of specific points in these tests as compared with the corresponding tests of other materials, for instance, metals. In the article[3] we consider the basic difficulties in procedure in fatigue testing of vulcanized rubber; it is shown that the complications, connected with the presence of relaxation effects and upsetting the dynamic pattern, may be overcome best in fatigue under conditions of symmetrical alternating cycles. In the same way it is necessary to consider the heat state of the test-pieces being tested for dynamic fatigue. For comparative tests at the same temperature the differences in the hysteresis properties of the vulcanized rubbers in question must be compensated for by varying the conditions of heat exchange with the medium.

Testing Conditions

The data presented below were obtained in conditions of alternating symmetrical loading on a given deformation pattern. This pattern is realized by the rotation of curved test-pieces having a cylindrical working portion of diameter 8mm. and length 23.5mm. The amplitude of deformation was varied from 14 to 33%.

The tests were carried out at a frequency of 3,000 rpm (50c/s). We constructed a set-up consisting of six thermostatted sections, in each of which there were tested simultaneously under identical conditions four test-pieces.[3] The temperature in the thermostat was selected so as to ensure an identical temperature of the test-pieces (120 or 100°) independently of the conditions of testing and of the elastic-hysteresis properties. As the temperature of testing we understood the temperature of the surface of the test-pieces measured while the machine was heated by means of a contact thermocouple of special construction. This method seems to us to be more correct in comparison with that recommended for this kind of test, where the temperature is measured in the centre of the test-piece[4], as the destruction of the test-pieces begins, naturally, at the surface.

The dynamic properties of the vulcanized rubbers in question were determined on the same test-pieces and under the same conditions of loading by means of a special apparatus. A short description of the set-up for fatigue testing and of the apparatus for determination of dynamic properties has already been given by the present authors[3,4].

Effect of the Type of Rubber

In Fig. 1 we show the dependence of the fatigue tensile deformation ε_{oy} upon the work capacity for unfilled vulcanizates based on natural rubber, SKB and SKS-30 and for vulcanizates of the same rubbers containing 40 parts by weight of channel black to

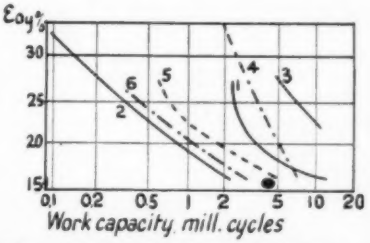

Fig. 1.—Dependence of fatigue deformation upon the work capacity in alternating-sign flexing. Traces are as follow 1, Natural rubber, unfilled; 2, natural rubber + 40 parts by weight of channel black; 3, SKB, unfilled; 4, SKB + 40 parts by weight of channel black; 5, SKS-30, unfilled; 6, SKS-30 + 40 parts by weight of channel black. Testing at frequency of 3,000 c./min.; T=120°. Dynamic modulus of the vulcanized rubbers, E: 1, 19.3; 2, 23.6; 3, 14.7; 4, 22.7; 5, 16.6; 6, 31.4 kg./sq.cm.

100 parts of rubber. These data were used to show the dependence of the fatigue strength f_{oy} and of the fatigue energy of rupture W_{oy} upon the work capacity, as shown in Fig. 2. The latter are calculated from the formulae

$$f_{oy} = E\varepsilon_{oy} \; ; \quad W_{oy} = E\,\frac{\varepsilon_{oy}^2}{2}$$

When we consider the data shown in Figs. 1 and 2b the following two facts attract attention:

*By M. M. Reznikovskii, L. S. Priss and M. K. Khromov (*Koll. Zh.*, 1958, **20** (3), 368-75). *Reprinted from Translation No. 667 prepared by the Research Association of British Rubber Manufacturers.*

1. The rating of the vulcanized rubbers according to increase in work capacity changes significantly on transition from one type of testing to another. Thus for instance if in the

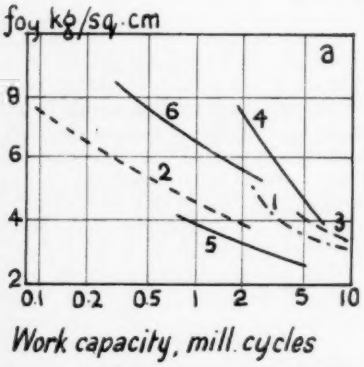

Fig. 2a. — Dependence of fatigue strength and fatigue energy W_{oy} in joule cm.^{3}. Traces are as follows: 1, Natural rubber unfilled; 2, natural rubber + 40 parts by weight of channel black; 3, SKB, unfilled; 4, SKB + 40 parts by weight of channel black; 5, SKS-30, unfilled; 6, SKS-30 + 40 parts by weight of channel black. Testing at frequency 3,000 c./min.; T = 120°

applied deformation unfilled vulcanizates of SKB and SKS-30 show a higher work capacity in comparison with the corresponding carbon black filled vulcanized rubbers, on the other hand in working with a given load we get the opposite picture. These data once again demonstrate the importance of the choice of the pattern for comparative testing with an eye to the conditions of service.

2. As may be seen from the data presented, filling with channel black, which leads usually to a significant raising of the strength characteristics of the vulcanized rubbers (tensile

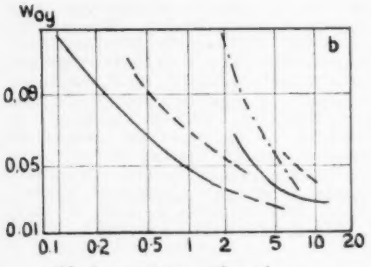

Fig. 2b. — Dependence of fatigue strength upon the work capacity under alternating-sign flexing. Traces and testing frequency as in Fig. 2a

strength, tear strength, abrasion resistance and so on) alters their fatigue properties comparatively little — it somewhat reduces fatigue deformation and increases the fatigue strength. On the basis of these data we may say that the fatigue properties of vulcanized rubbers are to a considerable degree determined by the type of the raw rubber. In experiments which we carried out jointly with Z. N. Tarasova, we were able to convince ourselves that the type of vulcanization group has also considerably less influence than the nature of the rubber polymer. Curves of the type shown in Figs. 1 and 2, obtained on rubbers with different vulcanization accelerators fall clearly into separate groups corresponding to the different types of raw rubber. Finally we carried out an investigation of a large number of tyre rubbers, which gave exactly the same result.

Some Comparisons

Thus, in testing under conditions of alternating loading and equal temperature the fatigue properties of the vulcanized rubbers are determined in the first place by the raw rubber. Thus in all cases we observe the following order of the vulcanized rubbers (in order of decrease of work capacity): vulcanized rubbers based on polybutadiene (SKB), polyisoprene (natural rubber) and butadiene-styrene (SKS-30). This result at first glance appears unexpected. It has long been considered that natural rubber vulcanizates have a definite superiority over those of SKB. This is supported also by laboratory data and the service characteristics of certain articles, in particular motor tyres. It is necessary therefore to explain why the tests carried out in the present study led to an opposite conclusion. We must recall first of all that laboratory testing is carried out usually with loading cycles of constant sign (with stretching or else compression) and in conditions of spontaneous heating of the test-pieces. In one way and another natural rubber vulcanizates are in a more favourable position. In point of fact, with the increase of the static component of the load the work capacity is still largely determined by the strength properties of the vulcanized rubbers[2] which are considerably higher for natural rubber vulcanizates. On the other hand, the relatively low internal friction of natural rubber vulcanizates gives them a more favourable testing pattern. In order to demonstrate this, we carried out comparative tests of carbon-black filled natural rubber and SKB vulcanizates under conditions of symmetrical loading and varied asymmetry of cycle.

The tests were carried out on the MRS-2 machine of the 'Metallist' works using solid test pieces, the working portion of which was of cylindrical shape, while the thickened ends allowed them to be secured in conditions of symmetrical and of asymmetrical loading.

The tests were carried out at a frequency of 500 c./min. under conditions of spontaneously developing temperature on a pattern of given amplitude of deformation. In Fig. 3 we show the dependence of the work capacity of natural rubber and SKB vulcanizates upon the degree of asymmetry, determined by the value of the average deformation of the cycle. The character of the dependence differs for the two vulcanized rubbers. If the work capacity of SKB decreases monotonically as the static component of deformation increases, then the work capacity of natural vulcanizates has a minimum for an average deformation of the cycle close to zero. We shall now endeavour to give this fact a simple interpretation, starting from the specific properties of natural rubber. We may, however, say that this type of dependence of the work capacity upon the static constituent of deformation can hardly be connected with crystallization, since at the temperatures and deformations employed, crystallization apparently does not take place.

Work Capacity

On the basis of the difference in the strength properties of natural rubber and SKB vulcanizates we might expect that the increase in the static component of deformation would lead to a slower decrease in the work capacity of the natural rubber vulcanizates. It is found nevertheless that the work capacity of the latter even increases, which leads to a quite significant superiority of the fatigue properties of the vulcanizates of natural rubber in repeated stretching tests.

The data shown in Fig. 3 show also that even in conditions of symmetrical alternating-sign loading, with spontaneous heating of the test-pieces, the work capacity of vulcanized rubber on the basis of natural rubber is somewhat higher.

Thus we demonstrate a second cause of difference between the generally accepted conclusions as to the fatigue properties of vulcanized rubbers and the results of the present study. The data presented show that comparison of the fatigue of polyisoprene (natural) and polybutadiene (SKB) rubbers may give exactly opposite results depending on the pattern of testing. The actual pattern of testing in the general case must be selected with regard to the conditions of service of the corresponding rubbers in the articles for which they are intended. With reference to tyre, and in particular breaker, rubbers it must

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be said that apparently the better agreement between the service properties and the data obtained in conditions of asymmetrical cycle of loading is no basis for the preference of the latter pattern in laboratory tests. In addition, the existing data are

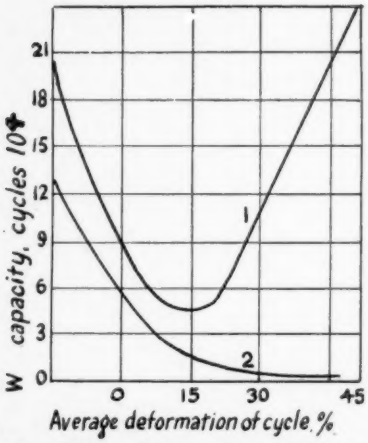

Fig. 3.—Dependence of work capacity upon the magnitude of the static constituent of the deformation. Traces as follows 1, Natural rubber + 40 parts by weight of channel black; 2, SKB + 40 parts by weight of channel black. Conditions of testing: Amplitude of deformation, 30%; frequency, 500 cycles/min.; T = 100° for 1 and 115° for 2

evidence that the symmetrical cycle is closer to the service conditions than is the constant-sign cycle[3].

In deciding the question of a rational method of comparative tests of tyre rubbers for fatigue work capacity we must bear in mind that articles may fail in service for a number of other reasons than destruction by fatigue. Apparently it is important also that in articles where the rubber is operating in conditions approximating to the symmetrical cycle we cannot exclude a periodical, though non-regular, action of large asymmetric loads (*e.g.* when the tyre strikes an obstacle), which undoubtedly is more decisive in tyres of butadiene rubber.

Without discussing this question further, we shall turn to certain other factors which put natural rubber vulcanizates in a more favourable position in a number of articles in service. In multi-ply and solid structures the highest temperature is developed in the middle layers of the article which are practically completely isolated from the access of oxygen. If fatigue destruction takes place in these layers, then a proper, laboratory assessment of fatigue properties should be carried out in an inert atmosphere. In addition, the manufacture of a complex multi-ply article, *e.g.* a tyre, inevitably involves a number of defects within the structure, which may become *foci* of destruction. Thus, perhaps, along with the test of solid test-pieces it is advisable to test test-pieces with previously inflicted damage.

The influence of the above factors upon the work capacity of natural rubber and SKB vulcanizates is shown in the following table:

Vulcanizates based on	Amplitude of deformation in %	Temperature in °C.	Work capacity in thousands of cycles: In air, Test-piece without notch	In air, Test-piece with 0.3 notch	In nitrogen, Test-piece without notch
Natural rubber ..	26.5	100	780	300	3,600
SKB	26.5	115	600	110	780

The data in the table were obtained with testing under conditions of alternating-sign flexing with spontaneous heating of the test-pieces.

As may be seen from the table, the damage to the test-pieces is considerably more pronounced with the work capacity of SKB vulcanizates. On the other hand, tests in an atmosphere of nitrogen give values for the work capacity of natural rubber vulcanizates exceeding by five times corresponding values in air, while for rubbers of SKB the alteration in the medium has little effect upon the work capacity.

Influence of Vulcanization

A study of the degree of vulcanization was carried out on vulcanized rubbers of the following composition: Raw rubber (SKS-30a, thermoplasticized) 100 parts by weight, sulphur 1.0 to 12.0 parts by weight, sulphenamide BT 1.0 part by weight, stearic acid 2.0 parts by weight, zinc oxide 5.0 parts by weight. As indications of the fatigue properties we took the fatigue strength, fatigue deformation and the fatigue energy of the cycle, corresponding to the work capacity of 10^6 cycles.

To determine these properties the tests were carried out at two amplitudes of deformation, with the work capacity somewhat lower or somewhat greater than 10^6 cycles. Then by interpolation on a semi-logarithmic scale (on this scale the fatigue curves practically straighten out, cf. Figs. 1 and 3) we determined the fatigue deformation corresponding to the work capacity of 10^6 cycles which was used later for the calculation of f_{oy} and w_{oy}.

The determination of the fatigue characteristics and dynamic properties of the vulcanized rubbers was carried out at 100°.

The dependence of ε_{oy}, f_{oy} and w_{oy} upon the total sulphur content is shown in Fig. 4. The fatigue deformation has a sharply expressed maximum for a content of sulphur equal to 1.8% which corresponds practically to the amounts of sulphur used in commercial rubbers. The fatigue strength increases monotonically as the amount of sulphur is increased, while the fatigue energy of the cycle, rapidly increasing up to contents of sulphur of the order of 3% and more, alters little. The study of the dependence of the fatigue characteristics upon the work capacity was effected only on a small number of specimens, not differing greatly in sulphur content. Within the limits of the investigation the character of the dependence remains unaltered.

Filler Content

Investigations of the influence of the filler content upon the fatigue properties of vulcanized rubbers were carried out on vulcanizates of SKS-30 with filler contents of 0; 2; 5; 10; 15; 20; 30; 40; 60; 80 and 100 parts by weight to 100 parts by weight of the raw rubber. As an active filler we used channel black, as a less active filler lamp black. The mixes had the following composition: raw rubber 100

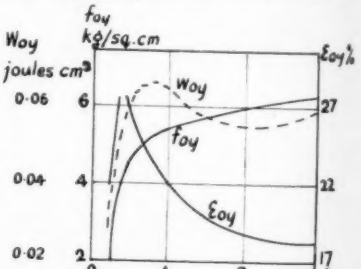

Fig. 4.—Fatigue characteristics corresponding to work capacity of 10^6 cycles for unfilled vulcanizates of SKS-30A with varying content of sulphur. Conditions of testing: Frequency, 3,000 c./min.; T = 100°

parts by weight, sulphur 2.5 parts by weight, Captax 1.5 parts by weight, stearic acid 2.5 parts by weight, zinc oxide 5.0 parts by weight, carbon black 0 to 100 parts by weight.

The determination of the fatigue and dynamic properties was carried out at 100°. The dependence of the fatigue charasteristics corresponding to the work capacity of 10^6 cycles upon the sulphur content is shown in Fig. 5. For both series of vulcanized rubbers the fatigue strength increases

monotonically as the sulphur content increases. Generalizing this result with the previous data we may say that for vulcanized rubbers operating in conditions of given amplitude of stress, every increase in rigidity as a result of the degree of vulcanization or of the content of filler has a good effect upon the work capacity.

For vulcanized rubbers with channel black the fatigue deformation passes through a maximum corresponding to a content of 15 parts by weight. For vulcanized rubbers with lamp black the scatter of the points does not allow us to say with certainty whether a similar maximum is absent or is found for very low contents of carbon black. In any case, in the greater part of the range investigated the fatigue deformation falls as the carbon black content rises.

The fatigue energy of the cycle for vulcanized rubbers with channel black increases as the content increases, while for vulcanized rubbers with lamp black it changes little. Study of the dependence of the fatigue characteristics upon the work capacity carried out on rubbers containing 10, 20 and 40 parts by weight of channel black showed that the character of this dependence remains practically the same.

We cannot fail to note the different influence of the filling upon the fatigue properties of vulcanizates from different raw rubbers. This was shown even by the data in Figs. 1 and 2. While for vulcanizates of SKS-30 the fatigue strength increases with filling, for SKB nevertheless it hardly alters, and for natural rubber it even falls off. Therefore the dependences shown in Fig. 5 cannot be regarded as an illustration of the influence of the filling upon the fatigue properties of vulcanizates on the basis of any raw rubber independently of other factors.

Influence of Plasticization

A study of the influence of the degree of plasticization upon the fatigue properties was carried out on vulcanizates with SKS-30A with different contents of vaseline oil. The results show that all the fatigue characteristics pass through a maximum corresponding to 20 parts by weight of plasticizer. The observed effect requires future study, however, since lowering of the fatigue characteristics may be brought about by defects (*e.g.* internal pores) occurring in many test-pieces when the plasticizer content is raised.

The present study is, apparently, the first investigation of the influence of the principal mix factors upon the fatigue properties of vulcanized rubbers as determined under symmetrical alternating - sign loading (eliminating the influence of relaxation effects upon the results) and with a given temperature of testing.

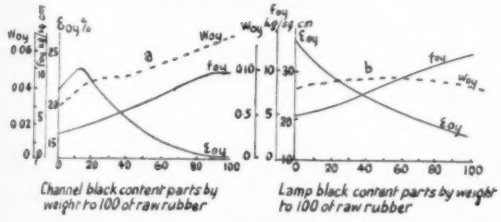

Fig. 5.—Fatigue characteristics W_{oy} in joule cm^{-3}, corresponding to 10^6 cycles for vulcanizates, with different content of channel black (a), and of lamp black (b); conditions of testing: Frequency 3,000 c./min.; T = 100°

It is therefore of indubitable interest and importance to carry out further study and assessment of such results as the superiority in fatigue properties of SKB vulcanizates over natural vulcanizates and the positive influence of active fillers upon the fatigue stress of natural rubber vulcanizates (all this, of course, under the testing conditions already used).

The data obtained are of interest for the illustration of the connexion between the fatiguing of the rubber and certain other of its properties which are more simple and therefore better studied.

Conclusions

1.—A study has been made of the fatigue properties of vulcanized rubbers under conditions of symmetrical alternating-sign loading, as a function of the principal mix factors: the type of raw rubber, the total sulphur content, the content and type of filler and the degree of plasticization.

2.—Under the conditions in question an important influence upon the fatigue properties is exerted by the type of raw rubber; vulcanizates based on SKB are superior to those based on other raw rubbers (natural rubber and SKS-30) in resistance to fatigue.

3.—A short analysis is given of causes leading to the loss of the observed superiority of vulcanizates of SKB under conditions of testing and in service.

The writers express their gratitude to Prof. B. A. Dogadkin for his interest in the work and his part in assessing the results.

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'Rubber Journal' Prize

THE 'Rubber Journal' Prize of £25 for a student at the National College of Rubber Technology has been awarded to **Michael John Turner.**

Mr Turner, who is 23, was educated at St. Olave's and St. Saviour's Grammar School, London (1945-54), and was awarded the Marshall Scholarship for a general knowledge and essay paper in his final year. He completed his two years' National Service in the Army before entering the National College of Rubber Technology in September 1956 when he was awarded the Monsanto Exhibition for the duration of the three years' full-time Associateship course. In the summer of 1958 Mr Turner went with a group of students from the National College to work for two months in the Bayer Chemical factory at Leverkusen, near Cologne, West Germany. He plays Rugby and, on occasions, football, for the Northern Polytechnic teams.

The prize will be presented by Dr J. W. Cook, F.R.S., Vice-Chancellor of Exeter University, on the occasion of the Fifth Convocation of the National College of Rubber Technology, to be held in the theatre of the Northern Polytechnic, Holloway, London, N.7, on Thursday February 26.

∴ The 'Rubber Journal' prize is awarded to the student under 25 years of age, who has enrolled in the three-year Associateship course, attained at the end of the second year the highest standard in practical rubber technology, and who will continue to attend for the third year of the course.

Rubber and Plastics News

CONTINENTAL AND FOREIGN DEVELOPMENTS

ACTUALLY on the market is a new butadiene-styrene latex having large particles and a high content of solid matter, to be used in sponge rubber. It is said to have a more uniform composition, less contraction when moulded and better ageing properties, than natural rubber latex, as well as excellent mechanical stability both in use and in storage. It is entirely compatible with natural rubber and confers the same good characteristics of comfort, for its ability to sustain loads is essentially equivalent. Used in combination with natural rubber latex, this new latex gives a rapid formation of fluid foam producing good moulding qualities. The new material is ideally suitable, it is claimed, for making moulded products such as automobile cushions, pillows and mattresses. It also offers interesting products to the maker of sheets and plates for the furnishing industry. The uniform dimension of the particles is equally revealed in the preparation of different adhesives and coatings with a latex base.

French Vertical Cutter

Small manufacturers in the rubber industry often spend too long in cutting up their rubber slabs. Some use knives, others employ machines of miscellaneous and not too efficient type. This means sprinkling the blade with water or powdering it with talc. Hygienic properties suffer, and in the presence of gelled gums, production falls seriously. A vertical cutter has been introduced by a French firm. It has a power of 20 tons. The blade is fixed, construction is robust, and consists of a special saddle on which is fixed a steel screw, with a piston in steel with bronze rings. It is claimed that from 60 to 80 cuts an hour can be obtained with this machine, and it is described as a quick-action cutter for gum slabs.

High Capacity Extruder

Another French invention is a high capacity extruder, with above average capacity, designed to follow on an internal mixer. It is primarily for working masses with a butyl base. The machine weighs 13 tons. It is equipped with a filter.

A comparative study of continuous and interrupted relaxations of variously accelerated vulcanizates has led to the conclusion that the principal factor in the development of stickiness is the first network structure. When stickiness is manifested, a great relaxation of the network is observed. This is shown by a greatly enhanced swelling and a notably reduced modulus. Stickiness seems to be caused by breaks taking place not only across double-links along the chains, but in addition, across intermolecular cross-links. These last are endowed with a varying chemical strength, according to the system of acceleration employed. As a result, development of stickiness may be prevented by combining the action of anti-oxidants and that of a deactivator.

Austrian Polypropylene

Austria is going to undertake the manufacture of polypropylene in a large way, with the aid of Italian capital. The formula will be of Italian origin, marketed in Austria as 'Daplen.' The works will begin to be built in the large suburb of Vienna known as Schwechat, not far from the site chosen for the erection of the largest refinery in Austria, which will become its most important supplier. It is forecast that Austrian production of polypropylene will reach 5,000 tons in 1961.

Planting in Cambodia

In Cambodia, a company is about to be formed with the participation of French plantations for the planting of selected plants. The culture of hevea is interesting the Cambodians to a greater and greater extent.

Kirim Chemical Centre

A new chemical centre at Kirim in Manchuria is to be provided by the Chinese with a works for producing organic synthetic chemical products, plastics and synthetic rubber. The first plastics works actually being constructed in Pekin will make polyvinyl chloride. A Nanking works has produced in an experimental station a type of fibre of laminated glass. The second five-year plan which will be completed in 1962 aims to produce 200,000 tons per year.

Reinforcement Process

From Germany comes a process of reinforcement for rigid moulded pieces or flexible pieces. Applied primarily to belts and tyres, the process consists of the embodiment of fibres or threads of polyolefines or co-polymers of polyolefine.

Spring Shock Absorber

Another invention is a spring shock absorber in rubber or similar material. It consists of an organ of revolution of symmetrical type, and hollow, capable of supporting a load under pressure exerted in an axial direction, without any need for internal guiding devices. The spring body presents at its upper and lower extremities transitional parts set with their terminal faces pierced by holes to allow of fixing. This is a Dutch patent.

Continuous Mixing

Another development of German origin is a process and apparatus for preparing continuously mixtures of rubber and synthetic materials. Use is made of an endless screw forming mixing and kneading organs. Mixing and kneading are carried out in two successive stages. The working of the material (first phase or stage) is done in thin layers, the elements constituting the mixture being maintained under pressure by a device ensuring arrival.

Tube Recovery

The Italians have put on the market a machine for re-covering non-vulcanized rubber tubes with threads in two or more layers. The tubes are designed to carry fluids under pressure. The machine applies in an inverse direction two helicoidal layers of thread at high operating speed. The bobbin-carrying rotors are placed side by side, and between the point of application of each layer of thread and the point of application of the following layer two controlled pulleys are provided so as to reduce the tensile stress on the non-vulcanized tube. This is strictly necessary in order to wind the threads from the bobbins, which are mounted on a single rotor.

Rubber Compressibility

In the French research institutes an experimental determination of the compressibility of a rubber has been carried out, starting with a material of great deviability. Two cases were envisaged, that in which the material was in the neutral state, and that in which it was in a deviated state. The elastic medium was subjected to

crushing action corresponding to an effort exercised by a platen, and was measured by a dynamometric assembly. The plexiglas case allowed the observer to watch the results. In normal procedure, the apparatus is filled with water, and pressure is transmitted by an intake of air.

Roumanian Synthetic Rubber

Roumania has been grappling with the principles of manufacture of synthetic rubbers. Two fundamental problems with which they have dealt are the synthesis of monomers starting from the raw materials, and the polymerization of monomers aiming to produce polymers having the properties of rubber. Their observations are recorded in a paper.

Isotactic Polymers

They have also been deciding in Roumania on the advantages of polymerization by radiations favouring the formation of grafted copolymers and block polymers. They suggest the possibility of using isotactic polymers that have not reacted and the application of these polymers to plastic materials, synthetic rubbers and synthetic fibres.

Japanese Research

The Japanese are continuing to study vinylic polymerization in connexion with styrene, methacrylate of methyl, acrylic nitrile, vinyl acetate and vinylidene chloride, by means of several organic polysulphides capable of initiating polymerization. Disulphides of diphenyl, dibenzyle, dibenzoyle, dithiobenzoyle, dibenzothiazyle and dialkyl xanthogene are inefficacious initiators, they claim, in the thermic polymerization of the monomers mentioned and within a temperature range of 60° to 120°C. Disulphides of tetralkylthiuram initiate the polymerization of styrene and methacrylate of methyl, but with crylic nitrile, vinyl acetate and vinylidene chloride they produce no polymerization. It has also been found that all the organic disulphides are excellent agents for the photopolymerization of these monomers.

Styrene Polymerization

The Japanese have also been studying the polymerization of styrene initiated by several disulphides of tetralkylthiuram at temperatures within the range of 50 to 90°C. It has been demonstrated that the speed of polymerization increases when the concentration of thiurame reaches a value of 0.3 to 0.5, and has an activation energy of global type from 17 to 23 kcal./mole. These thiurame disulphides retard polymerization of styrene and have a low initiating activity under these thermal conditions. However, in the presence of light, they are excellent initiators of polymerization, they claim.

HT Cable Insulation

The Germans have been studying the use of butyl rubbers for the covers of high tension cables. If it is desired to dispense with metal in these cable covers, the new insulating medium must keep its insulating properties in the course of operations carried out at high temperatures and during prolonged contact with water. Covers of synthetic thermoplastic materials or elastomers conform to these conditions, it is said. Comparative studies have been made of the important properties of natural rubber, neoprene, butyl rubber, polyvinyl chloride, and polythene, from the point of view of serviceability as a sheath or cover, and insulation. Butyl rubber is the material affording the best insulating properties. Next comes polythene. In Gemany, polyvinyl chloride is still valued because of its low price and non-flammable property.

Cellular PVC Preparation

The normal preparation of cellular polyvinyl chloride is by means of swelling agents, and this presents certain inconveniences. A new method consists in using gas under high pressure. It appears, according to the Germans, that it allows of producing cellular materials of improved quality. It is desirable that the gaseous mixtures used should not provoke rupture of the closed cells across which they are diffused.

Teflon Treatment

A new process for treating the surfaces of objects in Teflon so as to facilitate adhesion has been developed in France. It appears that this process, using a complex sodium naphthalene in tetrahydrofurane, is as effective as the sodium and ammoniac process. It relies on the use of a bath of good stability whose utilization does not demand the employment of a costly refrigeration plant, and does not lead to the formation of poisonous vapours. The results of tests show that the tear-resistance of samples of Teflon when caused to adhere by this process lies between 80 and 140kg./cm.^{2}, whether simple tearing or actual cutting is concerned. These values come very close to the resistance to tensile stress of the polymer itself and it has even been suggested that in some instances the Teflon sample was destroyed before the materials came unstuck.

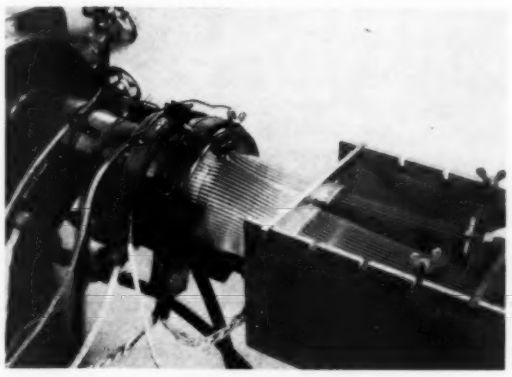
French Polyester Research

The importance of material of plastic type with a polyester base has led the French to undertake a systematic study of the characterization of the polyesters by an infra-red absorption spectrometer. A preliminary collection with a base of forty polyesters has been prepared by binary associations of eight diacids with five diols. Its spectral analysis has made it possible to demonstrate that a number of scales characteristic of frequency exist, according to the glycolic residues or according to the acid residues. Interpretations have been proposed for certain of these scales.

Tyre Sales Down

An increase in replacement tyre sales by United States Rubber Company was more than offset last year by a drop in new car tyre sales and the effects of the recession in other product lines, it was reported on February 12. Net income for 1958 dropped to $22,670,772, or $3.05 a share, compared with $29,695,027, or $4.27 a share in 1957, while sales slipped to $870,615,700 from $873,583,074.

Consumption of imported synthetic rubber in the US during October 1958 totalled 949 tons. This compared with 899 tons in September 1958.



A shaping and cooling jig has been developed at the I.C.I. Plastics Division, Welwyn Garden City, for extruding 'Diakon' reeded trough sections for fluorescent lighting fittings

BTR Belting Contract

Nearly six miles (9,000 metres) of rubber-covered conveyor belting designed and manufactured by BTR Industries Ltd., is now on its way to a large ore field in the Soviet Union. The contract was obtained against world competition and was completed on schedule within three months. This Soviet conveyor installation is believed to be unique in demanding belting of exceptional width designed to standards never before attained—and in that it is the first application of

BTR fourteen-ply rubber/'Terylene' belting for Russia: This is a section of 2,000 mm. (78¾ in.) wide belting. The cover thicknesses are 6 mm. (15/64 in.) top, inclusive of a nylon transcord breaker, and a 2 mm. (5/64 in.) back. The maximum working tension of this belting is 60,000 kg. (59 tons)

100% 'Terylene' fabric in a major conveyor system. The special heavy fabric was woven to BTR design from 376,000lb. of 'Terylene' yarn.

The belting has been supplied in three widths: 1,400mm. (55⅛in.), 1,600mm. (63in.) and 2,000mm. (78¾in.) and shipped in fifty rolls each about 180 metres (590ft.) long. It is made up of eight to 14 plies of 'Terylene' fabric with skim coats between plies—the widest belting with a 6mm. thick top cover including a nylon transcord breaker and a 2mm. thick back cover. 'Terylene' was chosen for the job because it is the fibre having the best combination of outstanding strength whether wet or dry, flexibility and resistance to impact, stretching, abrasion and rot. The maximum working tension in the wide belting is 60,000kg. (59 tons) and is capable of transmitting in excess of 1,000hp.

The 14-ply x 78¾in. belting is some of the widest and toughest ever made but, together with the narrower constructions, it troughs readily under its own weight. The belts are being vulcanized endless on site in the USSR with equipment designed and supplied as part of the contract.

RUSTYFA SOVIET ORDER

Rustyfa Ltd., the British consortium company founded in 1957 for the purpose of supplying plant and equipment for a large tyre factory now being built in the Ukraine, announced on Monday that, after negotiations in London with Mr S. S. Smirnov, deputy director of V/O Techmashimport, they have received a further order valued at over £1m.

This order, which is mainly for rubber processing machinery, together with those announced in 1957 and 1958, brings the total of Rustyfa's contribution to Britain's export drive up to £14m., the statement said. Plant and equipment so far shipped by Rustyfa for the tyre factory project is valued at nearly £3m.

Vitafoam Tanker

The tanker illustrated in last week's issue of the Journal was described as being used to carry latex between the Liverpool and Middleton factories of Vitafoam Ltd. We are now informed that in fact the tanker will be operating between the Henry Diaper bulk latex installation at Liverpool and the Vitafoam factories at Middleton and Oldham.

Mr John Clark

The death occurred on February 12 of Mr John Clark, who at the time of his retirement in 1948 had served 49 years with The North British Rubber Co., latterly as manager of the General Order and Dispatch Departments. He was 77 years of age.

Most of Mr Clark's service with North British Rubber was at the Castle Mills, Edinburgh, factory, though from 1924-31 he was located at the London warehouse. He was a member of the Rubber Trades Transport Committee. It is interesting to recall that in 1921 Mr Clark was awarded a prize of £100 by the Rubber Growers' Association for suggestions for advertising the uses of rubber.

In his young days Mr Clark was a first rate athlete, being an accomplished half miler. He was also an outstanding performer over longer distances and in winning a mile race at the beginning of this century he clocked 4mins. 33secs.—a notable performance in those days.

S Luigi Emanueli

Signor Luigi Emanueli, vice-president of the Pirelli Rubber Co., of Italy, died in Milan on Tuesday aged 76.

Canadian Polymer 1959 Budget

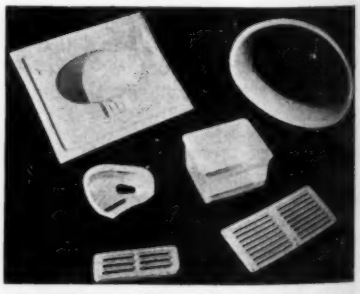
The 1959 capital budget of Polymer Corporation Ltd., Sarnia, Canada, was recently made public by E. R. Rowzee, president and managing director of the company. It reflects the general competitive conditions which prevail in the synthetic rubber industry on a world wide basis. The budget provides for expenditures of $6.6 million, all of which will be fully generated by the company's operations. An amount of $4.2 million is for capital items related to improving plant efficiency and product quality, providing increased operating flexibility and reducing operating costs.

This amount also makes provision for the beginning of a butadiene plant in Western Canada. Due to delays in the assured build-up of substantial gas exports from Alberta, the company has not yet completed the butane agreements necessary to supply the proposed plant in Alberta. The use of field butanes processed in Alberta continues to be the best means of filling Polymer's butadiene requirements.

The remaining $2.4 million is allocated to projects already underway. The new pilot plant for work on new polymers based on stereospecific catalysts and the new warehouse facilities which had been previously announced are included in this section of the budget.

Mr Rowzee expressed confidence that the projects included in this budget along with expanded efforts in marketing and research will maintain Polymer's competitive position in the world's rubber market.

Mr Basil E. Greene has resigned as a director of the Kurunegala Rubber Company (1929).



Non-inflammable Cobex (rigid vinyl) manufactured by BX Plastics Ltd., Chingford, London, E.4, has been used extensively in the internal fitting of Armstrong Whitworth's new freighter, the 'Argosy.' Various parts, such as window coamings, recess door handle liners, and accessories in the toilet compartments, are made in this material

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Sumatra Estate Take-overs

HOPE FOR A SOLUTION

MR ROBERT SANER, the British *chargé d'affaires* in Djakarta, met Dr Djuanda, the Indonesian Prime Minister on Monday, for a clarification of the recent seizure of certain British estates in north Sumatra. He said afterwards that he had received 'comforting news' from Dr Djuanda, and it was hoped that a solution would be reached in the near future. The meeting had been satisfactory and he was under the impression that the statement issued by the local authority in north Sumatra did not represent the policy of the Government. In this statement the head of the Agrarian Affairs inspection service in north Sumatra said on Sunday that the take-over of the estates followed the reception by his office of 'instructions from the central Government.'

A local official added that the foreign estates would be handed over to Indonesian firms if the long-lease concession rights had expired. He said the British estates taken over were Namu Unggas and Kuala Tiga, owned by Sandilands, Buttery and Company, London, because their concession rights had expired in May 1957. Notice had been served on three other British estates—Serapuh (Sandilands), Bangkahan (the Sipef Anglo-Dutch Company), and Sungeu Pendjara (Harrisons and Crosfield, London) and these also would soon be taken over and handed over to Indonesian firms.

Dr Sadjarwo, the Minister of Agriculture, said that what had happened to the British estates had nothing to do with nationalization plans or with the Indonesian Government's campaign for the 'liberation' of west New Guinea. The steps had been taken because the leases of the estates had expired and an investigation was now under way to find whether application for extensions had been submitted or not. If the leases were not extended the concessions would automatically become State property. There might be some oversight with regard to the application for an extension, he said.

Mr Sunarjo, the Minister of Agrarian Affairs, confirmed Dr Sadjarwo's statement and added that if an application had been filed, this would now come under the Foreign Investment Bill and would be decided by the foreign investment committee. Mr Sunarjo said some leases had expired long ago but this had only now come to light.

At the British Embassy, officials argued that it was customary to apply for extension of leases five years before their expiry, but in the case of these British estates no Government machinery or law was operating then. The companies had continued operations in good faith and had even started replanting and investing more capital. The Embassy officials suggested that at least a year's notice should be given before any take-over to give time for the removal of equipment by the owners.

Four-point Temperature Recorder

After extensive field trials, Fielden Electronics Ltd., Wythenshawe, Manchester, have announced their new transistorized four point temperature recorder. This has a 10in. diameter chart and operates from the normal 50 cycles mains supply. Resistance bulbs are used as the temperature sensitive elements and low range spans are easily achieved. The use of transistors has significantly reduced the power dissipated in the instrument and has resulted in improved performance and greater reliability. Particular features are the new improved stability control and the very high reproducibility. The instrument is also available as a single point recorder with electrical or pneumatic control.

New Semtex HQ

THE new headquarters of Semtex Ltd., the flooring manufacturers, have been moved from Hendon to 19-20 Berners Street, London, W.1. For some time it has been felt that the company (which is part of the Dunlop group) would be able to provide a better service for its many clients if its headquarters were more centrally situated, and now all main departments—export, marine, contracting, material sales, industrial and advertising—are housed in the new Semtex House. The new building has an effectively arranged permanent showroom on the ground floor in which the many different kinds of Semtex flooring are shown. Some of these have been used in the building, notably Semastic decorative tiles and, in the showroom itself, Dunlop rubber flooring.

In his speech of welcome on February 17, Mr Frank Smith, the newly-appointed general manager of Semtex, referred to the fact that the company was celebrating its 21st birthday this year. They manufactured rubber flooring for both domestic and industrial applications; different types of vinyl flooring; thermoplastic tiles; Fleximer jointless surfacings; and carpet underlay. Semtex also produced a protective flooring paint and wall veneer known as Semguard F.

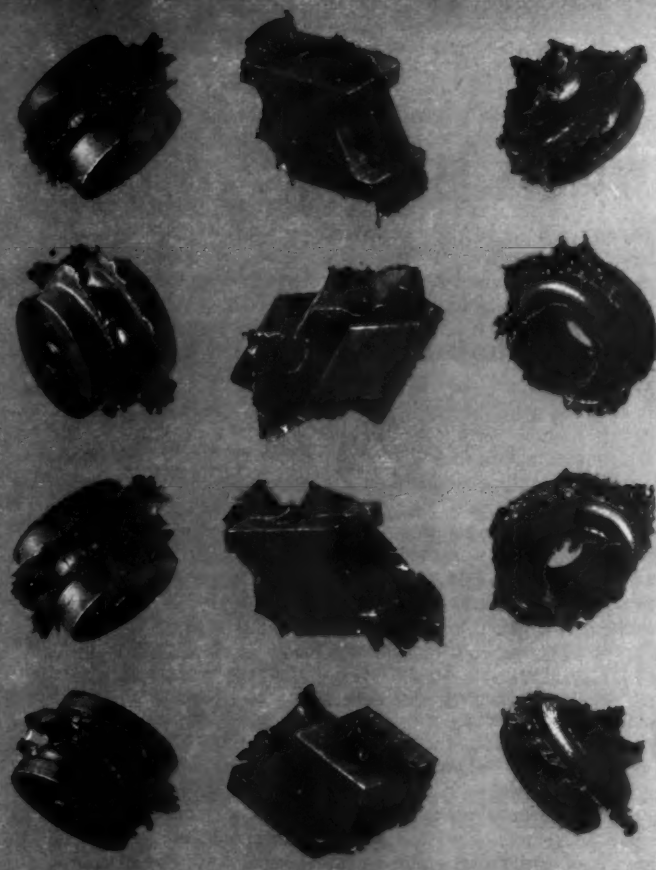
In the marine sphere recent developments of importance had been the introduction of three new types of decking made from synthetic rubbers: Semdec, Gripdec and Elasdec. Outstanding Semtex contracts recently obtained included 94,500 sq. ft. of Semflex tiles for the new American Embassy in Grosvenor Square; 12,600 sq. ft. of thermoplastic tiles for the new headquarters in Cheapside of the Sun Life Assurance Company; 47,500 sq. ft. of rubber flooring for the CPR liner 'Empress of England'; 22,500 sq. ft. of Semflex tiles in the new Shell building on the South Bank; and 18,000 sq. ft. of Vinylex tiles for the new Scandinavian Airways building in Oslo.

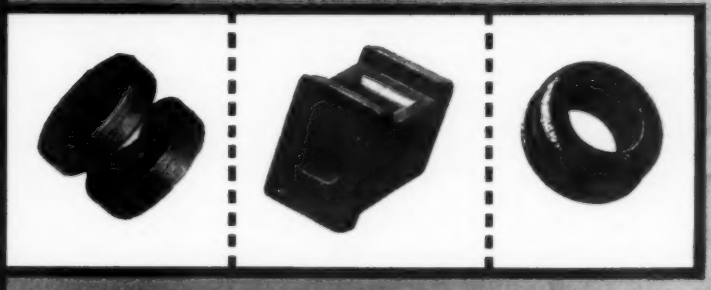
Dexion Sheeting

Three new developments of Undulite plastic sheeting have been announced by the Plastics Division of Dexion Ltd. Undulite is a fibreglass reinforced plastic sheet, translucent, light, tough, and with long weathering properties.

New Undulite 1in. reeded sheet is being marketed in standard weights, and can be supplied clear or diffused in eleven colours. The product is intended chiefly for decorative purposes in hospitals, hotels, offices and restaurants. Dexion are also producing an additional width of Undulite in standard ranges to match 3in. metal corrugation, particularly for the Cellactite new width of 34½in. A new sheeting to match Turners Asbestos Combined Sheeting is also being made in normal grades and will be available in lengths from 4ft. to 6ft.

De-flash small rubber parts with 'DRIKOLD' in the Columbian International Sub-zero Tumbler





By freezing small rubber components with 'Drikold' —I.C.I. solid carbon dioxide—in a rotating drum, flashes become brittle and break off with the tumbling action.

Sub-zero deflashing with 'Drikold' can
cut your costs
speed your processes
increase your production.

I.C.I. Technical Service Staff will advise on your problems, and will de-flash sample batches of your components on request.

Sub-zero tumblers are obtainable from Columbian International (Great Britain) Ltd., 110 Cannon Street, London, E.C.4.

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VIEWS *and* REVIEWS

He Jests at Scars . . .

'HE jests at scars who never felt a wound' is a very old, but nevertheless wise saying which, nowadays, as regards road accidents, for example, may be translated as 'It Cannot Happen to Me.'

A knowledgeable craftsman once observed to me that 'until you get the public on its hind legs about road accidents you won't get much done about it' and the fundamental reason was the 'it cannot happen to me' complex. And that, I might add, applies in my opinion, all over the world, and is a not unimportant factor in industrial accidents.

This brings me to the specific subject of this note, which I may introduce by saying that 'it has happened to me' by way of a small, but still painful and extremely annoying accident, when working with a rubber machine many years ago. This fact is one of the reasons why I am, perhaps, more likely to appreciate the wide importance of industrial accidents, and their implication. It follows that it is scarcely remarkable that I should particularly welcome literature based on practical research on the avoidance of industrial accidents in general, and those relating to the rubber industry in particular.

There cannot be too much serious work on the subject now discussed, and, for this reason, I was glad to see the review in *RJIP* on January 31 of the 'Report on Causes of Running Nip Accidents and Suggested Means for the Prevention of such Accidents,' issued under the aegis of the National Joint Industrial Council for the Rubber Manufacturing Industry through its sub-committee the Accident Prevention Committee, the latter technically supported by the Engineers' Advisory Committee, the members of which produced, as already noted in the *RJIP* Review by 'R.W.P.,' the present report.

The Running Nip

The 'running nip' has already been defined as existing wherever sheet material passes on to a roller or bar, but this may be repeated with benefit for those wishing to scrutinize the illustrations now reproduced in amplification of the data previously given in *RJIP*, which, I believe, have attracted considerable interest.

With regard to the proposed amplification, attention, then, may be called to Examples 1 and 2:

Example 1: Fig. 2 is a line drawing on page 20 showing a case of a running nip being formed between the material unwound from a roll and the floor, and the complete elimination of the hazard by fixing the lower roll in a new position (Figs. 3 and 4—pp. 20 and 21—are photos of the same feature, not shown here).

Example 2: Fig. 7 p. 25 is a line drawing of a simple type of interlocking guard utilizing a mercury switch. This guard is exhibited by the Ministry of Labour and National Service at the Safety Exhibition in Horseferry Road, London, and can be applied to a large number of running nips on machines used in the rubber industry. (Figs. 5 and 6, page 24—not shown here, are photos relating to the same feature.)

It is hoped that these illustrations will serve to make clear the nature in general of the 'Running Nip Accidents research.

Mr Lunn and his associates have done such fine work in the past on accidents in the rubber factory as regards, more especially, the mill, that one may look forward in

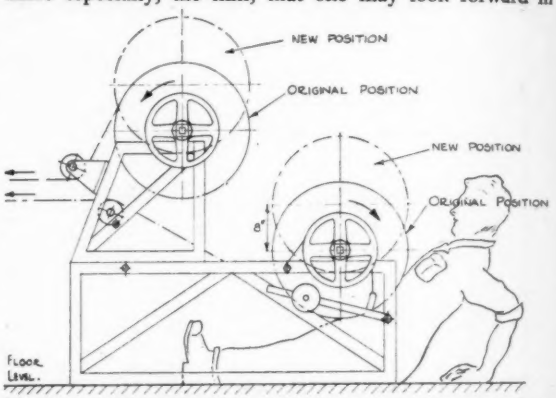


Fig. 2 shows diagrammatically the arrangement of a reel-off gear used on the feed side of a process machine. Accidents have occurred when an operative has slipped and assumed a lying position under the roll. It is shown how raising the roll centres provides sufficient clearance to avoid trapping of the human figure even when a full roll of fabric is newly fixed in position

(Reproduced from 'Running Nip Accidents' published by the NJIC for the Rubber Manufacturing Industry)

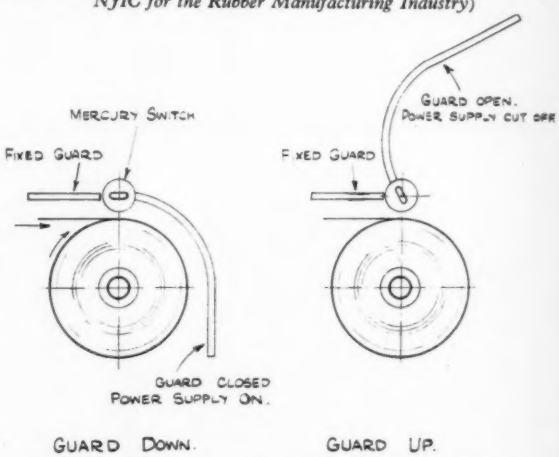


Fig. 7.—The diagrams illustrate the guard in the working and stopped positions

(Reproduced from 'Running Nip Accidents' published by the NJIC for the Rubber Manufacturing Industry)

confidence to equally useful results in connexion with the present work. In this connexion I quote a few words from the Preface by the Engineers' Advisory Committee:

'In spite of the help which this Report offers in the elimination of running nip hazards, we must recognize a long-range project. Work of this kind cannot be done

COMMENT ON SCIENTIFIC AND INDUSTRIAL MATTERS

by **DR SCHIDROWITZ**

in any short period. *We can hope and believe that the Report will be considered promptly** and that action will follow with all the speed which may be possible, but, a long time must elapse before the industry can cover the whole ground.'

This view is fortified by the appreciative Foreword by Mr T. W. McCullough, H.M. Chief Inspector of Factories, who indicates that an urgent solution of these matters is required. He also takes the occasion to look on the present Report as a step forward and hopes it will be widely read as a helpful manual of advice to the industry.

Air Pollution

With reference to my 'Perkin Medal' note in the issue of February 14 and the appreciation of Mr Houdry's work, and of Dr Lessing's remarks, I am now able, as then indicated, to amplify this subject by a brief reference to Dr Lessing's Presidential Address to the National Society for Clean Air given at the Llandudno Conference in 1958.

This address is particularly well worth closer scrutiny, but on this occasion I propose to quote only a few words and those relating to a subject on which, so far, knowledge seems to be still very slender.

Motor Vehicles Exhaust

Dr Lessing says (on page 6 of the reprint) that the exhaust from motor vehicles is a subject on which more knowledge on the cause and prevention of objectionable engine exhausts is badly wanted. 'This nuisance,' he observes, 'is a challenge to the oil and motor manufacturing industries to step up their researches. They should be qualified for the task and they will reap the benefit of any improvements effected.'

How this type of research should be carried out is indicated in The Presidential Address, but one important feature of the same was brought to the front by Dr Lessing when he remarked that 'collecting routine test results is not true research.' These are only facts needed by the investigator for drawing conclusions and it is his job to interpret the observations. Moreover he can only do this satisfactorily in relation to a well defined and circumscribed area and with additional information on a number of other matters (*as specified*).

Determination of Copper Traces

'Absorptiometric Determination of Traces of Copper in rubber chemicals and products' is the title of what appears to be a useful analytical paper by R. C. Madan (Firestone Tyre Ltd., Brentford), published in a recent issue of *Rubber Age* (1958, 84, 451).

The method, the author remarks, can be used by an experienced analyst to complete, for example, the determination of copper in zinc oxide, in about 20 to 30 minutes.

The basis of treatment described in the paper consists in treating the sample under test with zinc dibenzyl dithiocarbamate, and simultaneously extracting the copper complex thus formed with carbon tetrachloride in an acid medium. The intensity of the colour developed is measured on a spectrophotometer, and compared against a previously calibrated curve.

Apart from the rapidity of procedure the method is described as extremely sensitive. An advantage is that the reagent (zinc dibenzyl dithiocarbamate) is, apparently, readily available, being used—under the trade name Arazate—as an accelerator (*ref.* Abbott and Polhill; *Analyst* 1954, 79, 547 for details of manufacture and purification). Its great advantage, according to the author, over the sodium diethyl dithiocarbamate reagent, is that it can be used in moderate concentrations of mineral acids, and 'thus the "negative error" due to precipitation of copper together with iron is avoided.'

Interference from Other Cations

With regard to the hazard of interference from other cations Madan says: 'Metallic ions of materials ordinarily present in rubber chemicals or products do not present any difficulty in the complete recovery of copper (as shown in a table). Bismuth, nickel, cobalt, mercury and silver, however, interfere, though they will hardly be encountered in either rubber pigments or rubber products.'

(*Note:* For particulars of method, etc., *cf.* the original paper.)

Notes

Messrs Godfrey L. Cabot have issued: (a) An *Index* to the Technical Service Laboratory Bulletins series GD-1 to GD-22; (b) Technical Reports R-1 to R-10; RX-17; RX-24, and RG-101 and 102. The latest *Technical Service Laboratory Bulletin* from Messrs Cabot to reach me (GD-22), is by B. B. Boonstra and T. D. Bolt, and deals with 'Dispersion and Resistivity with Conductive Furnace Blacks.' On the theoretical side it is remarked that the relationship between conductivity and degree of dispersion of a carbon-black-in-rubber mix calls for poor conductance at very poor and very good degrees of dispersion with maximum conductivity in between the extremes of dispersion. The degree of dispersion is assumed to be very poor at the beginning of mixing and to improve to a limiting distribution with additional mixing or milling. Previously, E. Dannenberg (*I/EC; ref. given*) had studied effect of mixing time on dispersion of HAF in SBR, and found that owing to the relatively easier dispersion of HAF, the poorest degree of dispersion he obtained was still better than was needed to show a conductivity maximum. In the present research the electrical resistivity of an SBR 1500 compound containing conductive furnace blacks has been studied to show the effect of extremely short mixing times (*e.g.* 50 to 170 seconds), and of the number of remills (0 to 8). The blacks examined were the *Vulcans* XC-72; SC, and C, and in the remilling series an acetylene black was also examined for comparison. In the first set Dispersion Rating was also estimated (on the basis of % in less than 6.micron agglomerates by the method of Leigh-Dugmore; *RCT: ref. given*). As regards results, the authors' Summary says that maximum conductivity is achieved under conditions of very poor dispersion of furnace blacks in rubber. Since it is impracticable in normal factory operations to control dispersion precisely, the 'excellent conductivity retained when Vulcan XC-72 and Vulcan SC are well dispersed and remilled is noteworthy.' (*Tables* 1 and 2 respectively, show effects of short *Banbury Cycles*, and of remilling, respectively, on a number of physical properties. Other data including the Formulation of mix, are also given.)

PHILIP SCHIDROWITZ

*Italics are the reviewer's

Questions Corner—60

(Second Series)

259. Enumerate briefly some of the properties of polyvinyl acetate films.

260. There are several types of stabilizers used in compounding PVC, amongst these being metallic stearates. Give details.

261. Give brief details of some of the difficulties connected with 'pearl' polymerization.

262. Are any cellulosics used in the manufacture of records and recording tapes?

(Answers next week)

Answers to Questions Corner—59

255. It was discovered in 1935 (J.C.S.I. 1935, *54*, 1T) that phenol-formaldehyde and amine-formaldehyde resins can exhibit ion-exchange properties. Other substances also exhibit this property and there is a useful review, up to about 1942, in Ind.Eng. Chem. 1941, *33*, 697 and 1943, *35*, 859. There are two types of ion-exchange resins, viz. anion-exchange resins and cation-exchange resins.

Anion-exchange resins may be produced when certain amines and formaldehyde are reacted, *e.g.* aniline-formaldehyde or m-phenylene-diamine-formaldehyde, and other groups may be introduced to reinforce the basicity. Cation-exchange resins are produced by reacting polyhydric phenols with an excess of formaldehyde, using an acid catalyst. An excess of two molecular proportions, or more, of formaldehyde to one of phenol is used so as to ensure that the maximum insolubility of the resin is achieved.

The cations are removed by true ion-exchange and the resins may be regenerated by sodium chloride or a dilute acid. Ion-exchange resins can be used for water softening, for the separation of rare earths, the removal of ionic impurities from non-polar organic materials and the recovery of valuable metals from waste liquors.

* * *

256. In the early 1930's Carrothers observed the growth of polymer masses beginning from a polymer seed, and they appeared to occur autocatalytically at low temperatures, and under conditions not favourable to normal bulk polymerization. Such force was exerted by these growing masses that the walls of a heavy pyrex glass vessel broke. He pointed out that there was an analogy to the growth of living organisms (J.Amer.Chem.Soc. 1931, *53*, 4214; Trans. Fara Soc. 1936, *32*, 39). It was also observed that the type of popcorn growth is seen in styrene containing a small percentage of divinyl benzene. Using 1.25% divinyl benzene, heating at 150°C. gave normal polymerization with a transparent, cross-linked polymer. If, however, the mixture was heated at 100°C. there was considerable white opaque polymer formed (Ber. 1935, **68***B*, 1618; USP 2,537,951).

Styrene gives popcorn polymers with a number of bifunctional monomers, particularly when a small percentage of inhibitor is present to retard the normal reaction. The popcorn seed may be of different composition from the mixture of monomers being seeded. High temperatures usually results in less popcorn growth. (USP 2,331,263; 2,341,175; 2,205,390; 2,290,164; 2,311,615.) Ion exchange resins may be based on popcorn copolymers of styrene and other monomers. They normally have a large surface area. (USP 2,597,438; 2,597,449; 2,597,491-2.)

* * *

257. If one casts a syrup of relatively high polymer content, 10–30% dissolved in monomer, it is possible to reduce the shrinkage and exothermic heat with polymethyl methacrylate. Unfortunately the mouldings are somewhat sticky and their flow characteristics make them difficult to handle in normal moulding operations. Another method is to make a catalyzed slurry with 40–50% monomer, and 60–50 polymer in fine powder form. This mixture, when stirred, will gradually thicken at room temperature and after some minutes the slurry may be pressed into a mould and polymerized completely without the powder polymer settling out. Small mouldings can be heated at atmospheric pressure. The clarity is not very good but for dental work this is not important. (USP 2,101,107; 2,347,320; BP 484,343.

For dental purposes, soft strips, or blanks, were at first used, which consisted of the powder polymer, pigments, monomer, catalysts and inhibitors to permit of reasonable storage time. Even though they were supplied in sealed containers, and were kept in a refrigerator, they were not very satisfactory. The preferred method now is to use freshly mixed doughs, and the polymer is supplied separately from the monomer, which may be inhibited by a phenol or aromatic amine.

Another dental material is a premixed dough containing a polyvinyl-chloride acetate co-polymer blended with about 40% methyl methacrylate monomer (USP 2,315,503). Compositions have also been developed for setting without the application of external heat. This is made possible by dissolving in the monomer a tertiary amine, sulphinic acid derivative or other peroxide activator (Br.Plast. 1951, 24, 20; USP. 2,558,139).

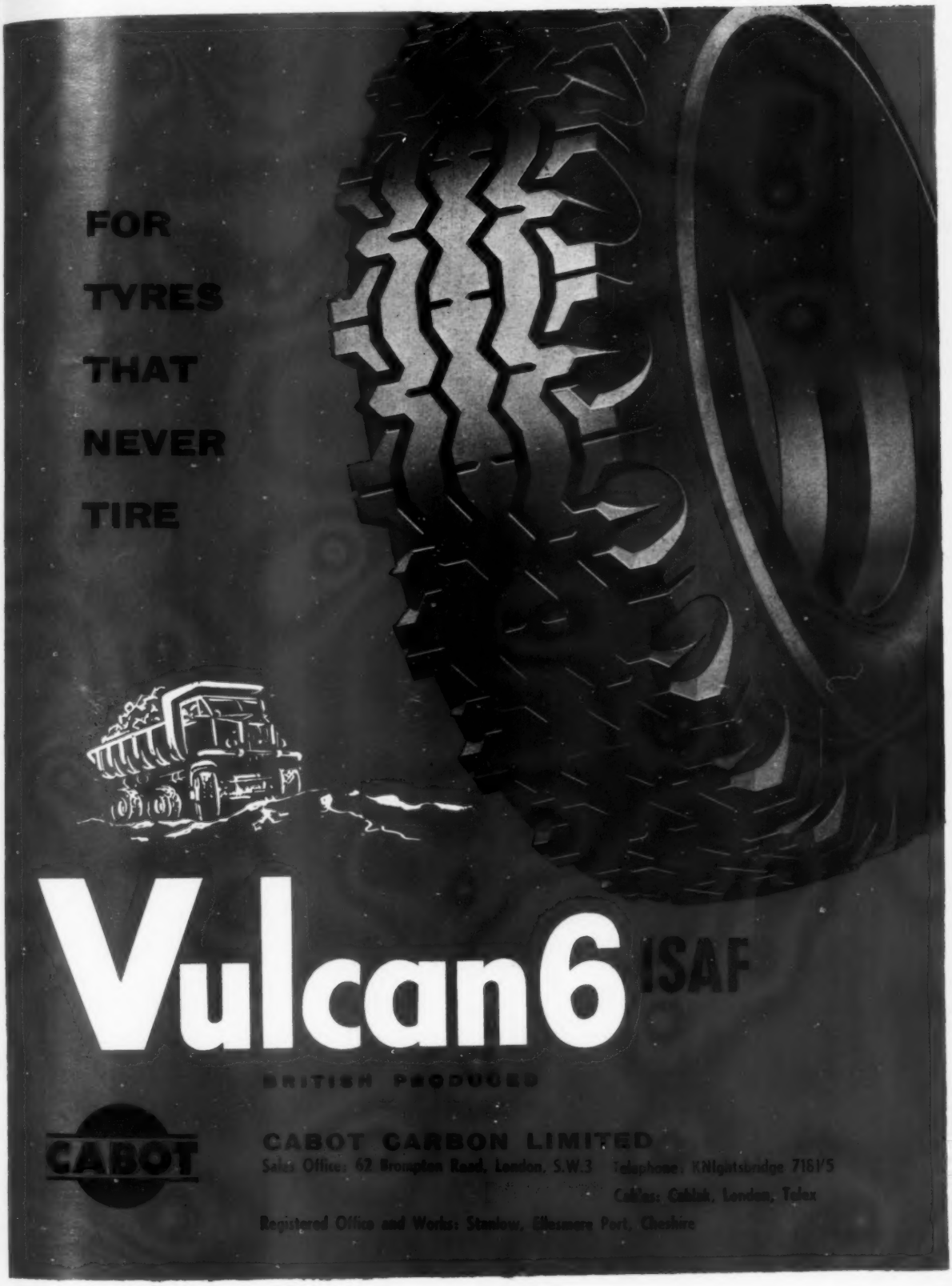
* * *

258. For the production of cellulosic sponges it is first necessary to prepare a viscose solution This is done by treating cellulose with caustic soda to form an alkali cellulose, which is shredded and aged under controlled temperature and humidity conditions until the original long chair molecule has somewhat broken down. The aged crumbs are then dissolved by treating them with carbon disulphide followed by an aqueous solution of sodium hydroxide. This forms a viscous orange solution which is known as viscose. Fibre hairs from shredded vegetable fibres are mixed into this solution and special water soluble salt crystals are also added.

If a large pore sponge is required then large salt crystals are used. If fine pore size then small crystals are used. It is important that an even distribution of these crystals is made so as to ensure that the pores of the final sponge are equally distributed. When the mixing has been completed, the material is poured into moulds and heated. The viscose then solidifies and the crystals dissolve to leave holes of the corresponding size.

(More questions next week)

'A peptizer is an anti-tranquilliser'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MEN and MATTERS

A Review of People and Events

by George A. Greenwood

FROM some points of view the most important news of the week concerns the taking over by the Indonesian Government of four British rubber estates in Sumatra and also all former Dutch estates throughout the country. Immediately upon the announcement being made, queries as to what exactly would be involved were raised but the results produced have done nothing, I am assured, to allay the disquiet which is felt in the industry, both in this country and in Holland.

Some gesture to attempt to clarify the situation was made when the British Charge d'Affaires in Djakarta made official representations to the Indonesian Foreign Ministry, and the Dutch Foreign Ministry told the Djakarta authorities that the proposals to make Dutch estates public property was 'completely unacceptable under international law.'

The only possible conclusion to be drawn from the announcement so far is that the Indonesian Government is suffering from a certain amount of confusion in regard to its own professed policies. We have several times been told that it desires to attract more foreign investment for the development of natural resources, whereas the most recent statement from the Ministry of Agrarian Affairs in Medan is that all existing concessions are, on expiration, to be taken over by national enterprises and to be handed over as going concerns 'with compensation to be determined by a commission.' This latter assurance is giving very little confidence to plantation interests in London and until a good deal more is known as to what really the Djakarta authorities have in mind, anxiety is bound to continue.

For myself, I share the opinions freely expressed to me by more than one prominent person in the industry during the past day or two that in any case there will be no confiscation.

A Valuable Scholarship

Interesting news comes from Worcestershire to the effect that Dr Nigel Cutler, of Stourbridge, has been awarded an Associated Iliffe Press Fund Travel Scholarship for the further education of men and women engaged in the plastics industry. Dr Cutler, whose candidature was sponsored by B.I.P. Chemicals Ltd., of Oldbury, Birmingham, where he is employed as development manager, moulding powders, will now be enabled to make a study of the technical and commercial developments of polyester dough moulding compounds in Europe.

Dr Cutler is presumably a Yorkshireman, for he was educated at Thorne Grammar School, Doncaster, and at Leeds University, where he received the degrees of Bachelor of Science (Chemistry) and Doctor of Philosophy. Selection was made on behalf of the donors by the Trustees of the Plastics Industry Education Fund, and although £1,000 was available for two scholarships, it was decided that Dr Cutler was the only candidate to merit an award.

In the USA, where polyester dough moulding compounds are used mainly in the production of automotive and electrical components, the estimated consumption of these compounds for 1958 was 25,000-30,000 short tons. The manufacture of polyester dough moulding compounds commenced about a year ago in this country, and if developments in Europe and the UK follow a pattern similar to that obtaining in the USA benefits to the car and electrical industries in particular could be considerable. These thermosetting compounds are presenting the manufacturer, designer and moulder, with new problems, and Dr Cutler's studies, involving visits to factories, research and technical institutes in Germany, France, Holland and Italy, should be of much value to the British plastics industry.

Purely Personal

Many people associated with the rubber and other industries in the Far East and in South-East Asia will be grieved to hear of the death of Mr Hugh S. Campbell, senior partner of Lyall Anderson and Co., East India merchants, company agents, and secretaries. Mr Campbell, who had reached an advanced age, had been associated with Andersons for over 30 years, and was either chairman or on the board of 14 or 15 companies. He was both chairman and managing director of the Bandarapola Ceylon Co. Ltd., chairman of Gedong (Perak) Rubber Estate, Patani Para Plantations, St. George Rubber Estates, the Scottish Tea and Rubber Trust Co. and so on. He had travelled a good deal in the interests of these various undertakings, and was well known in Ceylon.

There are, as we have said, changes in the control of Asahan Rubber Estates which will apparently take effect at or after the forthcoming annual meeting. Mr A. L. Mathewson, O.B.E., whose interests are so widespread, is resigning from the chairmanship, and announces that he does not intend to seek re-election to the board. In the chairmanship he is being succeeded by Mr F. W. Harper and, to fill the vacancy on the board, the election is recommended of Mr J. Morton whose connexion with rubber plantations requires no elaboration from me, for he is already on the board of seven or eight companies.

Mr Mathewson is, among other things, a director of Harrisons and Crosfield, chairman of Toerangie (Sumatra), Rubber and Produce Estates and vice-chairman of the Rubber Plantations Investment Trust Ltd.

You may often get news in question-and-answers columns. A City editor, asked by a subscriber about Reichhold Chemicals in which the enquirer says he has 'a handsome profit,' is reminded that the 5s. ordinary shares marketed in June 1952 at 7s. 6d. are now 23s., and he is assured that the company 'is certainly in the right field of industry.' I need not add that the inquirer is not exactly encouraged to sell!

That Price War!

Some of the daily newspapermen, especially gossip writers on the City and commercial pages, have been having something to say lately about an industrial price war. It is said that the idea is spreading, if the war has not already started. Various reasons are given, as for example in the cable trade, with which we are quite considerably concerned, the existence of a growing surplus capacity.

I had better quote precisely what one writer says about plastics: 'Prices of polyvinyl chloride remain low and uncertain because

What makes a chairman cheerful?...

In this case the thought that the solvent recovery unit installed a year or two ago has already covered its cost and is paying dividends. This plant adsorbs by active carbon valuable solvents previously lost by evaporation, and returns them for re-use over and over again. Substantial savings —cheerful chairman.

The net return from solvent recovery may well be higher than that from equivalent capital expenditure on expansion. And there's no risk about it. If you use solvents —even on a modest scale—have a word with us about recovery. We will not recommend plant installation unless we are quite satisfied that it will pay for itself—handsomely and soon.

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of the competition from imports, and the official prices give little guide to the present state of the market, but prices of other plastics remain firm, although some manufacturers have recently cut the selling prices of their plasticizers.'

There may be some logic about all this in the reference to foreign competition in polyvinyl chloride, and it could be that this particular writer has been influenced by the fact that at the beginning of the month the Distillers Company cut the spot prices of its higher phthalate plasticizers by £8 a ton. Most people in the industry to whom I have talked pooh-pooh the very idea that a plastics price war is probable. Why should producers cut one another's throats they ask, when we can, as we did last year, increase exports by 10,000 tons and £2,000,000? This man might have added that our plastics sales abroad have more than doubled in five short years, and that there are more countries than one which would buy bigger supplies if they were available.

News from Goodyears

There was an interesting and unusual party of visitors a week or two ago to the Wolverhampton plant of the Goodyear Tyre and Rubber Co. (Great Britain) Ltd. It consisted of 13 teen-age children from the Boys' and Girls' Club at the Odeon Cinema, Bilston, which is not so far away. The tour was a reward for writing essays on Charles Goodyear, the 19th century discoverer of vulcanization. The children, who were accompanied by the Mayor and Mayoress of Bilston (Councillor and Mrs A. E. Woolley), and others, were welcomed on their arrival by the Goodyear Director of Production, Mr J. Q. Shaul, and after the tour, which traced tyre building from the initial raw material stage to the finished product, he joined them for tea in the company's dining hall. The youngsters, in the course of their tour, collected a lot of information which they will use to help them write another essay, this time recording their impressions of the visit.

Proud Record

The resignation of Colonel G. W. Sharpe, O.B.E., T.D., from the board of Storey Brothers and Co. Ltd., Lancaster, has just been announced.

Colonel Sharpe is a grandson of one of the founders of the business and represents the third generation of the family to be associated with it.

Educated at Harrow and Cambridge, Colonel Sharpe began his business career when he joined Storeys in 1902. He was appointed to the board in 1919, and from 1930 to 1938, when he retired from full time executive duties, he was a joint managing director. This adds up to the fine record of 57 years' service, 40 years as a director. Now, however, ill-health has forced Colonel Sharpe to break his long association with the company, of which he has always been so proud and to which he has contributed so much.

Mr S. B. Nicolson has been appointed Deputy Chairman in succession to Colonel Sharpe.

Pirelli Branch

New branch premises have been opened by Pirelli Ltd. to cover the eastern half of London and the Eastern Counties. They are at Lyon Road, Selinas Lane, Dagenham, Essex, and the telephone number is Dominion 1911-2. The new branch will operate independently of the recently established North London and South London Districts, although it too will come under the overriding control of Mr F. Briggs, divisional sales manager, South.

Mr D. G. Gething has been appointed manager of the London East District. The area under his control will include the East and East Central Postal Districts of London, and the counties of Essex, Suffolk, Cambridgeshire, Huntingdon and Norfolk. For the past nine years Mr Gething has represented Pirelli Ltd. in South London.

A Golf Ball Pioneer

Mr Jack Smart, only survivor of the team that started golf ball manufacture in 1909, has retired from the company after 51 years. For the past eight years he has been in charge of tyre examination in the service department at Fort Dunlop, Birmingham.

Mr Smart was only a boy of 14 when he joined Dunlop. He recalls that when the golf ball department was formed the following year it consisted of five people: the manager, another man, three women and himself, all of whom worked in one small room! Jack Smart's job was to make the golf ball shells, a task for which he was paid 6s. 8d. a week. In those days balls were made of gutta percha with a solid rubber centre. It took four minutes to make one, and output was a gross a day, as compared with the many thousands manufactured today.

When golf ball production was suspended early in the Second World War he moved over to tyre manufacture, with which he has been connected ever since. A happy retirement, Mr. Smart!

A New Callender's Enterprise

New premises in Cardiff to cater for the South Wales interests of British Insulated Callender's Cables Ltd. were formally opened at a pleasant little ceremony there last week when Mr C. H. Broughton Pipkin attended from headquarters, and the ceremony was performed by Mr W. A. Gallon, chairman of the South Wales Electricity Board. The new premises face the Cardiff (Queen Street) Station, and have a total floor area of 19,000 sq. ft. with a storage capacity of 80,000 cu. ft.

Mr Broughton Pipkin, who is Callender's commercial manager, said that although industrial conditions were not at present easy in South Wales, he believed firmly in the future of the area.

Actually news comes in from all parts of the country of this feeling of confidence which is engendered by inquiries and orders in both the rubber and the plastics industries. For example, Francis Shaw and Co. of Manchester, announce that they have received orders worth over £400,000 from Eastern European countries for manufacturing machinery.

The biggest, worth £179,000, has been placed by Techmashimport, of Moscow, for the supply of plastics mixing equipment, extruders and other plant for producing polythene film and plastic sheeting.

Other orders received were from Masino Impex, Zagreb (£102,000), Invest Import, Belgrade (£72,000), and Polimex, Warsaw (£50,000).

Suggestions Pay Off

As a beneficiary many many years ago in one of the first industrial suggestion schemes, I am interested in a note from the North British Rubber Co. Ltd. Mr David Burrows, an operative in its US Royal Tyre building dept., has been awarded a sum of £49 for a suggestion he submitted under the company's scheme, and which has been adopted. It has already resulted in the fuller use of tyre cord.

Making Use of Science

IRI MIDLAND SECTION

PAPERS read at IRI meetings frequently describe applications of science to problems in the rubber industry but usually emphasize the results obtained. At their meeting on February 9 the Midland Section invited three speakers to outline briefly the roles physics, chemistry and mathematics play in leading to such results.

J. M. Buist, I.C.I. Ltd., representing physics, emphasized the importance of a good grounding in classical physics. Though the physicist came later than the chemist to the rubber industry, his influence was now wide and ranged over manufacturing processes, laboratory techniques, development of new products and improvement of old ones. He worked not alone, but in collaboration with the chemist, technologist and engineer, whose points of view he must try to understand. Heat-transfer problems in vulcanization and insulation were quoted as examples, and also the use of stress-strain characteristics of foams to indicate their cushioning properties.

W. C. Wake, RABRM, taking the part of mathematics, explained two recent additions to the 'jungle of jargon'—linear programming and theory of games. These were not yet widely understood nor much used, but the illustrations given showed how they might be applied to help decide what stocks to hold or what policy to adopt in a competitive market.

W. F. Watson, RABRM, dealt with the role of chemistry and pointed to the industry's indebtedness to chemistry for the materials it now used. 'Blind bottle-searching' had been replaced by a scientific approach in which the division between physics, chemistry and technology was hard to see. In illustration he described how a physical picture of rubber crystallization had led to a chemical method of making anti-crystallizing rubbers by adding thio-acids.

Opening the discussion, E. F. Powell expressed the theme of the evening: it was now uneconomic to be unscientific but, although discussions in scientific language between scientists were usually understood, the value of science in industry would be even greater if more attention were paid to explaining it to non-scientists in non-scientific terms.

DUTCH PLASTICS

The Dutch firm of AKU of Arnhem, and the State Mines, of Limburg, have opened a combined plastics sales office, Verenigd Plastic Verkoopskantoor, at Zeist, near Utrecht. The purpose of the combined office is to increase the efficiency of marketing operations. According to Mr H. H. Wemmers, manager of the State Mines, the new office will be of importance for the European Common Market and for the expected co-operation between the Common Market and other European countries.

The manager of the new office, Mr M. J. Van der Hoeven, has said that in 1938 Holland imported 2,085 tons of plastics valued at 1.12 million guilders, compared with 41,500 tons valued at 115.6 million guilders in 1957. In 1938, Holland exported 549 tons of plastics valued at 0.5 million guilders, compared with 27,610 tons valued at 71.7 million guilders in 1957.

Mr G. E. Buss has been appointed to the boards of the Mambau (FMS) Rubber Co. and Gedong (Perak) Rubber to fill the vacancy caused by the death of Mr H. S. Campbell.

Canadian Asphalt and Vinyl-Asbestos

Production of asphalt floor tiles in Canada in 1958 declined to 20,744,849 sq. ft. from 22,978,007 in 1957, but output of vinyl-asbestos floor tiles increased to 31,017,387 (22,246,176 sq. ft.). Year's domestic shipments of asphalt floor-tiles dropped to 20,335,081 (21,743,126 sq. ft.) in the preceding year, while those of vinyl-asbestos floor tiles advanced to 28,862,247 (20,484,996 sq. ft.).

December production of asphalt floor tiles was down to 836,755 sq. ft. from the like 1957 total of 2,115,834 and domestic shipments to 1,616,885 sq. ft. from 1,754,137. Month's output of vinyl — asbestos floor tiles was up to 3,481,289 sq. ft. from 1,765,259 a year earlier and shipments to 2,826,876 sq. ft. from 1,645,408.

Plastics Resistant to Gamma Radiation

ELASTOMERIC materials used for flexible sheathings and coverings in the construction of atomic power stations and laboratories have to operate at somewhere near ordinary temperatures (0° to 30°C.) under gamma (and other) radiations from nearby radioactive materials. The behaviour of plasticized polyvinyl chloride under intense gamma radiation was recently investigated by the Atomic Energy Research Establishment in conjunction with The Geigy Co. Ltd., and the report on this joint work (AERE) Report No. E/R 2518: 'The Degradation of Plasticized PVC Compositions under High Level Gamma Radiation') showed that the useful life of the PVC is markedly affected by the type of plasticizer used, the best of those so far examined being tritolyl phosphate (TTP; formerly called tricresyl phosphate).

Geigy report that they have compared the behaviour of TTP with that of their trixylyl phosphate (TXP) and have found no significant difference between the two in respect of radiation resistance. TXP can thus be used in place of TTP in this field.

The comparison of TTP with TXP was made under conditions similar to those of the earlier investigation, except that the composition used contained 35% of plasticizer (instead of 40%) and the test material was exposed to radiation from spent reactor fuel (instead of cobalt 60). The specimens were all slightly bleached at 1.1 x 10^7 rads, and blackened at 1.1 x 10^8 rads.

Each figure in the table below is the average from eight specimens. S.s.d. = the smallest significant difference calculated on 42 degrees of freedom, at the 95% level, is 0.7; any smaller difference could be due to experimental error. The tensile product is the product of the tensile strength and elongation of the specimen at breaking point, and is roughly proportional to the work done in rupturing it. It is a useful measure of the 'toughness' of a material.

Gamma radiation dose	Tensile product	
	TTP	TXP
None	5.7	5.9
1.1 x 10^7 rads ...	5.8	6.3

Canadian Rubber Consumption

CONSUMPTION of rubber—natural, synthetic and reclaim—in Canada in November 1958 increased 7.7% to 21,436,000lb. from the corresponding 1957 total of 19,902,000. Consumption of natural rubber advancing to 8,890,000 (7,908,000lb.), synthetic to 9,586,000 (9,055,000lb.) and reclaim to 2,960,000 (2,939,000lb.). The month's consumption of natural rubber accounted for 41.5% of the total consumption, compared with 39.7% the year before; synthetic for 44.7% against 45.5%, and reclaim for 13.8% against 14.8%.

November consumption of all rubber in the manufacture of tires and tubes increased 14% to 15,118,000 (13,263,000lb.). The month's consumption of all rubber in the output of wire and cable declined to 677,000 (747,000lb.); in footwear, to 1,614,000 (1,644,000lb.) and in all other products to 4,027,000 (4,248,000lb.).

Stocks of natural rubber at end of November amounted to 4,297 long tons, compared with 4,105 at end of October, and with 4,335 tons at end of November 1957. Stocks of synthetic amounted to 8,787 tons against 8,780 and 7,702, respectively, and of reclaimed 1,423 tons against 1,442 and 1,563 tons, respectively.

Domestic production of synthetic in November amounted to 12,133 tons, compared with 12,465 tons in October 1958, and 11,465 tons in November 1957. Reclaimed production amounted to 608 tons in November, compared to 642 tons in October, and 527 tons in November 1957.

New Rubber

During the second half of 1958 Canadian consumption of new rubber (natural and synthetic) showed a marked recovery from the low levels of the two preceding six-month periods and the rubber industry is looking forward to record consumption in 1959, according to the Rubber Association of Canada. Members of the Association, who account for about 90% of total Canadian consumption, used 40,649 long tons of new rubber in the second half of 1958, compared with 36,027 tons in the first half and with 36,617 tons in the second half of 1957. With this improvement in the second half, consumption for the full year 1958 amounted to 76,676 tons, only 4.3% less than consumption of 80,146 tons in 1957.

Greig B. Smith, manager and secretary, reports that Association members expect to consume 43,861 tons in the first half and 42,058 tons in the second half of 1959, for a total of 85,199 tons, which represents an increase of 12% over consumption in 1958 and, if realized, will constitute a new record. The previous high was 83,711 tons consumed in 1956. Synthetic rubber, mainly of Canadian origin, continued to gain ground from natural rubber, imported from the Far East during the past year, rising to 55% of total new rubber consumption against 53½% in 1957. The proportion of synthetic rubber is expected to creep fractionally higher in 1959.

Goodrich Polyurethane

The B. F. Goodrich Chemical Company is entering the polyurethane field, producing a new material under the trade name 'Estane VC.' Claims for the new material include high tensile strength, solvent resistance, low air permeability and abrasion resistance. The company says Estane VC is being produced on a semi-commercial scale at Avon Lake, Ohio.

Rubber Crop Returns

THOMAS BARLOW AND BRO.

	January 1959 lb.	Fin. year to date lb.	
Bradwall (FMS)	142,500	142,500	(168,500)
Chersonese (FMS)	65,000	65,000	(57,000)
Highlands and Lowlands Para	1,661,300	1,661,300	(1,504,200)
Klabang	100,000	100,000	(94,000)
Krian	11,800	11,800	(11,240)
Muar River	137,000	137,000	(151,000)
Sungei Krian	169,000	169,000	(188,000)
Manchester North Borneo	87,177	683,794	(620,640)*

*Ten months. All the rest one.

CEYLON AND EASTERN AGENCY

	January 1959 lb.	Fin. year to date lb.		No. of months of fin. year to date
Grand Central	1,361,114	1,361,114	(1,366,808)	1
Nagolle	70,588	70,588	(83,840)	1
Doloswella	22,420	22,420	(20,734)	1
Rajawella	162,149	966,168	(825,620)	7
Sunnygama	103,709	103,709	(122,267)	1
Timbang-Deli	103,000	983,000	(1,012,500)	10

HARRISONS AND CROSFIELD LTD.

Java

	December 1958 lb.		No. of mths. of fin. year to date	Fin. year to date lb.	
Bajoe Kidoel	229,473	(179,752)	9	1,895,044	(1,912,440)
Djasinga	118,204	(119,062)	6	693,764	(731,059)

	December 1958 lb.		No. of mths. of fin. year to date	Fin. year to date lb.	
Mengkibol	102,500	(76,000)	12	947,000	(852,000)
Malaya General	237,000	(170,000)	4	872,000	(665,000)
Sedenak	225,000	(194,000)	2	417,000	(380,000)

	December 1958 lb.		No. of months
Elpitiya Rubber	364,468	(288,501)	3

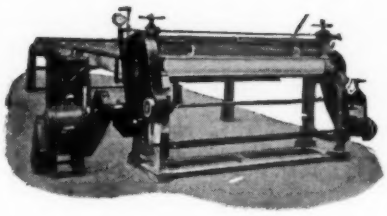
GEO. WILLIAMSON & CO.

	December 1958 lb.		Fin. year to Dec. 1958 lb.	
Ceylon (Para)	165,392	(103,764)	1,475,066	(1,346,648)

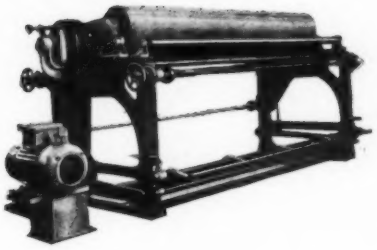
	January 1959 lb.	
Kemasul	49,300	(47,000)
Inch Kenneth Kajang	188,000	(200,000)

	January 1959 lb.	
Scottish Malayan Estates Ltd. and subsidiaries	398,500	(411,600)

Latex Engineering Co



Motor Driven Spreader



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Review

RUBBER HANDBOOK (Kautschuk-Handbuch). — Published in four volumes by Berliner Union, Stuttgart, Germany. Price for the series, D.M. 300, 340 or 380, according to conditions of payment.

As the publishers' leaflet rightly points out, 25 years have now passed since the publication of Hauser's Handbook of General Rubber Technology. Very great technical progress has been made during these intervening years and the present volumes are designed to take account of this.

The General Editor is Dr Siegfried Boström who has written a number of sections and has been assisted by numerous specialists.

Volume I, which is due to appear in July 1959, will deal with natural rubber and various types of synthetic rubbers. Volume II, which is to be published in December 1959, will cover PVC, compounding ingredients, reclaim and a few polymers such as silicones not described in Volume I.

Volume IV is not expected to make its appearance until July 1960. It will include latex technology, test methods, and the manufacture of belts, proofed fabrics, dipped articles, ebonite and the bonding of rubber to metal.

The volume now under review (Volume III) is the first to make its appearance and deals with some important aspects of rubber technology. It contains articles on tyres, thread, shoes, balls and hollow articles, cellular rubber, cables and insulated wires, erasers and flooring. Each section is by a separate author, or, in some cases, by two authors working together. As is natural in compilations of this kind, the sections vary considerably in their quality, scope and approach.

The opening section by Dr-Ing Erich Bobeth and Dr Siegfried Boström on tyres comprises 164 pages. It is in every way excellent, being clear, up-to-date and covering every aspect of tyre construction not only practical but also theoretical. The illustrations of different types of tyre failure and their causes are of great value. The authors have been at pains to deal with machinery, mixes, and methods of construction, including those for tubeless and solid tyres. Even the manufacture of airbags has not been forgotten. There is, however, no reference to the methods used for the repair and retreading of tyres, surely an important subject for readers of this book.

The section on thread is short (six pages) and contains little information of practical value. The same applies to the description of the manufacture of playballs and hollow articles (18 pages). Too much space is devoted to ancillary operations and the description of the actual make-up of the balls is inadequate. There are a number of inaccuracies. As every schoolboy chemist knows, sodium nitrite alone does not evolve nitrogen on heating (page 226). Playballs are measured not as the authors say, in English inches (page 225), but in terms of the Rhenish inch; an old German measure.

It is obvious that the author of the section on footwear has had long practical experience. Much information is given which it is difficult or impossible to find elsewhere, although it is a pity that it contains no detailed description and proper definition of the fabrics since these form an important part of the make-up of many types of boots and shoes. The section includes an excellent description of modern vulcanizing methods and, in general, is full of useful information.

The description of cellular rubbers has a less practical aspect, the mechanical side—moulds, vulcanization and the like—being neglected in favour of mixing formulae.

It is obviously impossible for any author to describe the manufacture not only of rubber but of thermoplastic insulated cables in a mere 30 pages. The description, therefore, is bound to be inadequate, although mention is made of many newer insulating materials and a useful bibliograph of some 32 references has been provided.

On the other hand the section on erasers is excellent throughout, its 10 pages being crammed with useful practical recommendations.

The treatment of rubber flooring (10 pages) contains much irrelevant matter and falls below the standard set in some other sections.

A special word of praise is due for the binding, which is in a flexible plastic material and represents a long overdue advance in this direction. With so many excellent and water-resistant materials available at the present time it is regrettable that the vast majority of books still use binding materials which were current in the last century or earlier and from which the colour is all too readily removed to the hands or clothes of the reader.

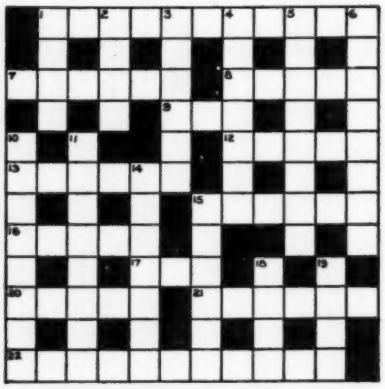
∴ Copies may be ordered through the Books Department, RUBBER JOURNAL AND INTERNATIONAL PLASTICS, Maclaren House, 131 Great Suffolk Street, London, S.E.1; price for the series, including postage and packing, £26 3s.

Hamilton Machinery Sales

Hamilton Machinery Sales Ltd., 32 Buckingham Palace Road, London, S.W.1, have been appointed UK agents for their principals, Buss Ltd., Basle, Switzerland, in succession to Aldersley Agencies Ltd.

Mr William Anderson has been appointed a director of Taiping Rubber Plantations.

RJIP CROSSWORD



CROSSWOOD No. 65

CLUES ACROSS

1. Rest pen? Slap again for the vulcanizer. (6, 5)
7. An open document conferring the exclusive right to make or sell an invention.
8. Country associated with rubber.
9. Lop off phenol and get the bird.
12. Trawl by the sound of it and it means the same.
13. The lad has a drink first.
15. These tendencies become apparent when treads show a loss which is replaced by a point.
16. Lamps are at night (3, 2).
17. Wood formed from metal at a loss.
20. Belonging to them but the successor is at the end.
21. Not alkaline.
22. Rubber will do this in ozone.

CLUES DOWN

1. Proverbally associated with work, Jack.
2. The top formerly at the end.
3. One way or another I get into ether.
4. A couple get around another ten for the rope.
5. Pipes are placed thus when they are laid (3-2-3).
6. Dipped rubber goods could be so described.
10. Pumped-up but flat in the centre.
11. A method of examination of a small mark (4, 4).
14. Temper or not the ruler is included.
15. A fruit mother has to one side and the other.
18. Is father around the Italian city?
19. Lithium and I get together for the filler.

(Solution appears on page 300)

Plantation Share Survey

THE tone in most of the 'commodity' sections of share markets during the past few weeks has been firm. The rubber group has been no exception, in fact, it has established itself as unofficial leader.

Considerable importance was attached in the City to the year-end consumption figures of the US. These showed that the quantity of natural rubber consumed was higher than had at one time seemed possible, and further, that the quantity of natural used in relation to synthetic had remained on a comparable basis to that of the previous year.

In the rubber industry there are quite a number of prominent people who feel that the total quantity of natural consumed will remain fairly constant over the next three years at about one-third of the total rubber used. The current figures go a long way in supporting this contention, which if proved to be correct, will make rubber shares the most underpriced commodity in the UK today.

The firmness of this section of stock markets has also been helped by the further rise in the quotation for raw rubber. The Russians have again entered the market and there are signs that the off-take of the Western World is again on the increase.

With this backcloth it was not surprising to see 'leaders' like UNITED SUA BETONG advancing on a fairly broad front. They now stand at a peak level for the 1958/59 period of 70s. This is 34s. up on their low point during the same time. The advance is obviously one of much consequence but when examined in the light of the 50% dividend and the existing earnings cover of 1¼ times, the yield of 14% obtainable on these shares seems out of all proportion. It is true that some falling off in earnings may place the full 50% rate in jeopardy, but it is unlikely that there will be a sweeping reduction in either profits or dividends.

Shares of the MALACCA group were also a firm spot with a rise of around 1s. to 31s. 3d., this, too, is a high point. The earnings cover is slightly better than 'Suas' but once again it is difficult to justify the present yield of 14%.

SUNGEI KRIAN ordinary were a very active market last week and put on 1s. 6d. to 41s. 6d. GOLDEN HOPE also showed a considerable improvement. KUALA LUMPUR, BERTAM, LONDON ASIATIC and KEPONG all stood out in a host of plus signs.

The current take-over favourite of the rubber section is the MERLIMAU PEGOH concern. About two months or so ago its shares were a quiet 1s. 6d. and appeared speculative even at this level. Since then there has been a wave of buying which has depleted the market of stock and pushed the price up to around 2s. 3d.; at one time it was as high as 2s. 6d. The feeling in the City is that any take-over offer, if one ever matures, will not be much in excess of 2s. 3d. and that holders might be well advised to dispose of their shares at the current level with a view to obtaining a higher yield elsewhere.

The directors of TEBRAU RUBBER have announced a large increase in the crop for the six month period ended December last which has in turn led to a rise from £13,200 to £30,000 in the trading profit.

The net profit of SEDENAK RUBBER on the other hand is down by around £6,000 to £12,000 but the dividend is held at 17½% for the year. The 2s. ordinary shares are currently quoted at around 2s. 2¼d., which is a peak point for the 1958/59 period, and they have remained at this level despite the fall in profits which the market had apparently been expecting.

Shareholders in the SEPONG RUBBER firm are soon to get a capital repayment. The balance sheet contains cash surplus to immediate requirements and this is being used to reduce the existing ordinary capital from £120,000 to £90,000. The repayment will entail 5s. on every £1 ordinary share.

There is to be a reduction in dividend from the LINGGI PLANTATIONS group, the directors have recently announced a total dividend of 16⅔% tax free which compares with 18¾% last time. The shares showed very little response to the news and were only slightly down on balance at around 4s. 1½d., which is 4½d. below their best level.

The trading profit is in the region of £286,000 which goes against £338,000 previously, taxation to be charged on this amount is £125,000, a rise of £29,000 which leaves the net profit at around £161,000 as compared with £184,000. The directors state that the crop was a record of nearly 10 million lb. and that the fall in profits was entirely due to the lower price obtained for rubber.

An offer has been received by the board of LOWER PERAK to purchase the £88,324 of 2s. units at 2s. 4d. each. Preceding this news that shares had been up to 2s. 4½d. on hopes that such an approach would be made. The company is no longer engaged in rubber production having sold all its estates and the net assets amount to around 2s. a share. It seems that the bid is very fair and reasonable and despite the optimism, as evidenced by the higher stock market price, the City view seems to be that it should be accepted.

A share bonus in the ratio of one for two is to be made by the BUKIT TUPAH concern. The company has also received proceeds of £203,000 for the sale of its estates and it has been decided to pay a capital dividend of 1s. per 2s. share. The board considers that the company should participate further in the plantation industry by means of direct investment of surplus funds in other companies. It therefore proposes to change the name to Tupah Investment Company.

MALAYA RUBBER PLANTERS is also proposing a share bonus. This time it is in the form of a write up of the 3d. shares to 1s. each. The final dividend of 133⅓% brings the total for the year up to 200% whilst there is also a capital distribution of 100%. The net profit comes out at £14,600 against £21,200 after tax of £13,000, a fall of £5,000.

New Foamed Plastic and Paper Material

The St. Regis Paper Co. and the Monsanto Chemical Co. in the US have formed a jointly-owned concern, Fome-Cor Corporation, to manufacture a foamed plastic and paper sandwich material. The new company will assume full responsibility for operations resulting from a joint technological and development programme that has been under way since early in 1956.

Fome-Cor consists of foamed plastic and paper laminated by a continuous process into a new material which retains high compression strength under severe moisture conditions. It is capable of a broad range of uses for containers, displays, stage settings and many other applications. Already made in three grades on a semi-commercial basis at the Superior Paper Products Company plant of St. Regis, in Mt. Wolf, PA, the sandwich material will soon be produced in a new and larger plant at Addyston, Ohio, which will be operated by Fome-Cor along with the Mt. Wolf installation.

US Plastics Sales Prospects

A surge in January business has caused an upward revision of volume predictions in sales of reinforced plastics this year, according to the reinforced plastics division of the Society of the Plastics Industry.

In a report to the annual conference in Chicago, an initial prediction of a 15% gain over 1958 sales was raised to around 20% to about 225,000,000lb. (1958, 185,000,000 lb.)

Motor cycle tyres with white sidewalls are now being produced by Dunlop.

Rubber Statistics

LATEST TOTALS FOR NR AND SR

INFORMATION now released by the Secretariat of the International Rubber Study Group brings the production and consumption data for natural and synthetic rubber up to the end of November. In the following table which is expressed in 1,000 long tons, the natural rubber production position at the end of November is compared with the similar position at the end of November 1957:

NATURAL PRODUCTION

	Jan.-Nov. 1958		Jan.-Nov. 1957	
Malaya:				
Estates	349½		337	
Smallholdings	242½		247	
		592		584
Indonesia:				
Estates	216		231½	
Smallholdings	331		399½	
		547		631
Ceylon		89		87½
Thailand		131		116
Sarawak		35½		36½
Other British Borneo		18½		17½
Liberia		38		34
India		21½		21
Belgian Congo		31		30
Others		159		172½
		1,662½		1,730

Production in Thailand has increased by well over 10%, and there have also been slight gains in other producing territories, but these have not been sufficient to offset the magnitude of the reported shortfall in the case of Indonesia; about the reliability of these statistics, however, there is a certain element of doubt.

The following table shows the natural rubber consumption totals for these eleven months:

NATURAL CONSUMPTION

	Jan.-Nov. 1958	Jan.-Nov. 1957
UK	159	164
USA	438	500½
France	125	123
Western Germany	125	127½
Remainder of Europe	437	330
Others	518½	495
	1,802½	1,740

It is interesting to note that the increase in natural rubber consumption during this period (62,500 tons) is roughly equal to the decrease in production (67,500 tons). This further strengthens the view that the latter totals are not altogether reliable. The very considerable increase, by over 100,000 tons, in consumption in Europe apart from France and Western Germany, is probably mainly due to increased purchases by East European countries. The marked decline in US consumption of natural rubber, amounting to about 12%, is also clear from the above table.

Synthetic Rubber

In the case of synthetic rubber, the decline in US consumption is even greater, amounting to over 71,000 tons, as against 62,500 tons in the case of natural, but this only represents between 8% and 9% of the total, reflecting the extent of the change-over to synthetic which has been taking place during these months of recession in that country. Otherwise, as may be seen from the table which follows, there has been some slight increase in consumption of synthetic rubber in other countries, except perhaps for those in Europe apart from France and Western Germany, for which, however, the total are only estimated.

SYNTHETIC CONSUMPTION

	Jan.-Nov. 1958	Jan.-Nov. 1957
UK	57	51½
USA	787	858½
France	51	45
Western Germany	47	44
Remainder of Europe	48	51
Others	117½	112½
	1,107½	1,162½

Brazil

The Comissao Executiva de Defesa da Borracha has now published details of the Brazilian rubber position up to the end of July last.

During the first seven months of the year, production of natural rubber totalled 14,185 tons, and included 641 tons of latex. Imports of natural rubber during these months amounted to 10,240 tons of crude and 179 tons of latex. Consumption amounted to 26,140 tons of crude and 636 tons of latex, the comparable total for the same period of 1957 having been 22,915 tons. Tyres for cars and trucks accounted for 17,203 tons, while 1,710 tons went into tubes for cars and trucks, and 1,255 tons were used for repair materials.

Stocks of natural rubber on hand at the end of July had fallen somewhat compared with the beginning of the year, from 6,837 tons to 5,015 tons in the case of crude rubber, in spite of a slight rise in the case of latex from 213 tons to 244 tons. Stocks of rubber in producing areas at the end of the period are reported to have amounted to 2,035 tons, those in consuming areas to 1,637 tons, and those afloat to 1,343 tons.

Synthetic rubber imports during these months totalled 950 tons, while consumption amounted to 1,094 tons. Stocks of synthetic at the end of July amounted to 632 tons on January 1. Reclaim rubber production / consumption amounted to 4,977 tons, while stocks of reclaim fell from 577 tons at the beginning of the year to 446 tons at the end of the period.

Export Opportunities

Surgical Rubber Sundries

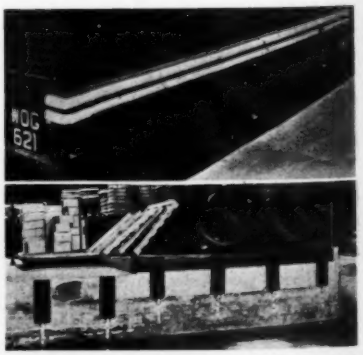
Tender No. F. 300/58, issued by The Cape Provincial Administration, Stores Department, Cape Town, contains requirements for surgical rubber sundries. Included in a list of 16 items are some 17,000 catheters; tubes, bottles and sheets. Closing date is March 3 1959. Bids should be sent to the Chairman of the Tender Board. A photo-copy of the tender documents is available, price 4s., from the Board of Trade, Export Services Branch. B.o.T. reference: ESB/3435/59.

Rubber Products—Cambodia

The International Cooperation Administration of the US Government has recently announced the commercial imports programme for Cambodia. (American financial year 1959.) A total allocation of $17,870,000 includes, under ICA code 891, rubber products to value of $500,000.

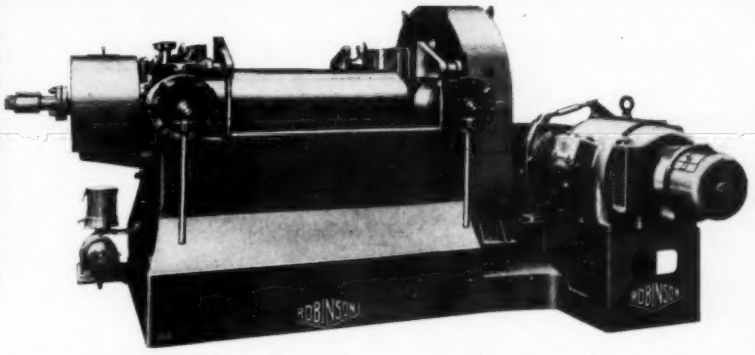
ICA Missions may be contacted c/o The US Embassy or Legation in the capital of the country concerned. B.o.T. reference: ESB/3434/59/ICA.

The address of the Export Services Branch of the Board of Trade is Lacon House, Theobalds Road, London, W.C.1. Telephone number: Chancery 4411, extensions 776 or 866.



Fendering installations manufactured by the Goodyear Tyre and Rubber Co. are now in use in over 70 countries, according to the company's house organ, *Transportation*. There are a large number of applications ranging from jetty and tug, etc., fendering to commercial vehicle (*above*) and loading bay (*below*) protection

Specialist Engineers to the Rubber and Plastic Trade



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PATENT SPECIFICATIONS

The following information is prepared from published Patent Specifications. The full Specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 3s. 6d. per copy (including postage).

Catalyst for the Polymerization of Ethylene

No. 803,779. Phillips Petroleum Co. Application and Filed, December 28 1956. Application in USA, December 30 1955. Published, October 29 1958.

A catalyst for the polymerization of ethylene and other polymerizable hydrocarbons comprises a mixture of (1) one or more halides of titanium, zirconium, hafnium or germanium; (2) one or more hydrides of aluminium, gallium, indium or thallium or complexes of these hydrides with alkali metal hydrides, and (3) one or more organic halides of a specified type.

In the two examples, the catalysts consisted of (a) a mixture of lithium aluminium hydride, titanium tetrachloride and allyl bromide, and (b) a mixture of lithium aluminium hydride, titanium tetrachloride and ethyl bromide. By the use of catalysts according to the invention, the polymerization reaction, particularly for ethylene, can be initiated and carried out at relatively low temperatures and pressures. The ethylene polymers produced have high molecular weight and very high impact strength.

Adhesive Bonds

No. 804,663. The Research Association of British Rubber Manufacturers, W. C. Wake and Minister of Supply. Inventors: W. C. Wake and E. W. Russell. Application, May 11 1953. Filed, February 11 1955. Published, November 19 1958.

Natural rubber or rubber-like polymers are bonded to rigid polymeric materials by means of a tertiary butyl compound capable of generating free radicals which can react with both materials to be bonded and cause them to unite. The rubber-like polymers may be SBR, nitrile rubber or silicone rubber and the rigid polymeric materials may be vinyl polymers of all classes, unsaturated polyesters of the contact resin type or hydrocarbon polymers. Tertiary-butyl perbenzoate is a convenient substance for the production of the necessary free radicals, and the bonding of natural rubber to polymethylmethacrylate is described as an example of the process.

The invention is applicable, for example, to the production of laminated sheets of rigid material, in which the interlaminate is rubbery, and to the bonding of a resilient mounting of rubber to transparent plastic cockpit covers.

Synthetic Resins Containing Aluminium

Nos. 804,981-3. Chemische Werke Albert. Application and Filed, November 25 1955, February 29 1956 and April 17 1956, respectively. Application in Germany, December 24 1954, March 4 1955 and April 21 1955, respectively. Published, November 26 1958.

804,981.—Synthetic resins containing chemically-combined aluminium are made by reacting stabilized aluminium alcoholates with polyhydric alcohols and then distilling off the volatile components from the product.

804,982.—Synthetic resins prepared by the process of No. 804,981 are claimed as hardening agents for epoxide resins.

804,983.—Synthetic resins prepared by the process of No. 804,981 are claimed for use in compositions for surface coating and other purposes.

Leather Article

805,027. Midland Silicones Ltd. Application and Filed, May 6 1957. Application in USA, August 7 1956. Published, November 26 1958.

A leather article for use as a semi-permeable oil seal has a surface coating of a cured siloxane. The coating consists essentially of 5 to 20% of a methylhydrogenpolysiloxane and 80 to 95% of a polysiloxane gum having a viscosity of at least 1,000,000 cs. at 25°C. The organic radicals in the gum are lower aliphatic hydrocarbon radicals, having less than 4 carbon atoms, or phenyl radicals. The siloxane is applied to the leather in the form of a solution and is cured after application. Leather seals so treated have a greatly increased resistance to oil compared with untreated seals or seals impregnated with polysulphide rubber.

Motor Car Mats

Nos. 805,235-6. United States Rubber Co. Application and Filed, November 28 1955. Application in USA, February 25, 1955. Published, December 3 1958.

805,235. A car mat comprises a moulded laminate of stretchable fabric and vulcanized rubber, the fabric forming the wearing surface. In making the mat, the laminate of stretchable fabric and unvulcanized rubber is moulded by a vacuum moulding process and the rubber is vulcanized by heat while the laminate is on the mould. The customary open mould which is shaped to the negative of a car floor surface is satisfactory.

A backing layer of sponge rubber may be provided, this backing layer being applied in the unvulcanized condition to the laminate before moulding and being vulcanized simultaneously with the solid rubber layer of the laminate. The solid rubber layer may be of the kind normally used for car mats or it may be a resin-rubber blend, *e.g.* of the kind described in Specification No. 632,722.

805,236. A car mat is of similar construction to the mat described in Specification No. 805,235, except that a vinyl resin such as PVC is used to form the laminate instead of rubber. The vinyl resin is applied to the stretchable fabric in the form of a plastisol or as a calendered film, the laminate being vacuum moulded. When a plastisol is used, this is heated to a temperature sufficient to fuse the resin and plasticizer prior to vacuum moulding. A backing layer of sponge rubber or foam rubber may be attached to the vinyl resin layer with adhesive after the laminate has been removed from the mould.

Shorter Abstracts

Copolymers. 804,561. W. T. Miller. Filed, November 26 1948.—A solid perfluorocarbon of high molecular weight is made by copolymerizing perfluoropropene and tetrafluoroethylene at a temperature below 0°C.

Coating Metal with PVC. 804,516. Montecatini Societa Generale per l'Industria Mineraria e Chimica. Filed, September 10 1956.—A metal article is rendered resistant to corrosion by a coating of PVC bonded to the metal by a polymer of a substituted or unsubstituted vinyl pyridine.

Squeegee Blades. 804,707. Le Materiel de Voirie. Filed, November 23 1956.—A rubber squeegee blade of the kind used for street cleaning is reinforced with flexible metal in the form of narrow strips or wires of small diameter.

Copolymer. 804,736. Minnesota Mining and Manufacturing Co. Filed, October 14 1955.—A thermoplastic copolymer of trifluorochloroethylene and vinylidene fluoride is claimed containing 0.1 to 6.0 mol. % of vinylidene fluoride.

Mixed Polyesters. 804,839. Imperial Chemical Industries Ltd. Filed, May 6 1957.—Mixed polyesters are formed by the condensation of 1,5-pentane diol with mixtures of adipic and glutaric acids. The mixed polyesters are claimed as plasticizers for PVC. They are efficient plasticizers and have good resistance to migration and to extraction by solvents.

Polythene Sheet Material. 805,389. Union Carbide Corporation. Filed, March 27 1957.—A sheet material comprises a polythene film laminated to a fabric of polythene or polypropylene fibres. The laminated material has the advantage over polythene film of greater resistance to tearing.

Rubber Markets

LONDON

Prices in the London rubber market have fluctuated within narrow limits during the past week and record little change on balance. The Spot is unaltered at 25⅜d. per lb. The market has been very quiet and the course of prices has followed levels established in the East.

Latest prices are as follows:

No. 1 RSS spot: 25¼d.-25½d.

Settlement House:

March 25¼d.-25⅜d.
April/June 25⅜d.-25⅝d.
July/September 25⅝d.-25⅞d.
October/December 25⅞d.-26d.
January/March 26d.-26⅛d.

No. 1 RSS cif basis ports:

February 25¼d.-25½d.
March 25¼d.-25½d.

Godown:

March 86⅛ Straits cents nominal.

Latex

Centrifuged latex per gallon in drums, February/March shipment, 14s. 10d. seller, cif European ports. Spot, seller, 15s. 4d. Bulk, seller, 15s. 2d. Creamed, seller, 14s. 5d. Normal, seller, 11s. 4d.

SINGAPORE

The market ruled extremely quiet throughout the morning of February 16, with the majority of dealers disinclined to trade. Lower grade interest was fair with sellers rather more inclined to meet the market than of late. In the afternoon, the market was still quiet but rather more active in lower grades, with interest being shown for most grades. Prices for No. One's were static throughout. After hours, the market continued quiet.

Straits cents per lb., fob Malayan ports to open ports

	Close	Previous Close
No. 1 RSS, March	85⅛—85⅜	86 —86¼
April	85⅜—86⅛	—
No. 2 RSS, March	83⅜—83⅞	—
No. 3 RSS, March	83 —83⅛	—
No. 4 RSS, March	82⅛—82⅞	—
No. 5 RSS, March	80 —81	—
No. 1 Spot ..	84⅞—85	85⅛—85⅜
No. 3 blanket, thick remilled, March	78 —80	—
No. 1 fine pale crepe, March ..	87⅛—88⅛	—

Tendency: Quiet

Latex, native produce, 60% centrifugal, packed in rec. drums fob 165.20d. per gallon.

BANGKOK

No. 1 RSS

The price for No. 1 RSS, at Bangkok on February 16 was 27.75 (27.75) US cents per lb.

NEW YORK

The following landed prices ruled in New York on February 16:

Dealers' Prices

Cents per lb.

	Feb. 16	Previous
No. 1 RSS, Feb	30b –30¼a	30⅜b–30⅝a
Mar.	30b –30¼a	30⅜b–30⅝a
No. 2 RSS, Feb.	29⅝b–29⅞a	29⅞b–30⅛a
Mar.	29⅝b–29⅞a	29⅞b–30⅛a
No. 3 RSS, Feb.	29½b–29¾a	29⅝b–29⅞a
Mar.	29½b–29¾a	29⅝b–29⅞a
No. 1 RSS, Spot	30b –30¼a	30⅜b–30⅝a
No. 3 amber blanket crepe, Feb.	28n	28½b–28¾a
No. 1 latex, thin crepe, Feb.	30⅜b	30½b
No. 1 latex, thick crepe, Feb.	—	30½n

Futures—Rex Contract

US cents per lb.

	Close	Prev. Close
March ..	30.10b–30.30a	30.25b–30.35a
May ..	30.15b–30.20a	30.25b–30.35a
July ..	30.18b–30.20a	30.25b–30.35a
Sept. ..	30.20t	30.25b–30.35a
Nov. ..	30.15b–30.25a	30.25b–30.35a
Jan. ..	30.15b–30.25a	30.25b–30.35a
March ..	30.15b–30.25a	30.25b–30.35a

Sales: 14. Tendency: Quiet.

Rubber futures were barely steady in meagre volume on February 16. Traders said the market was featureless, with light factory interest in physicals meeting a fair amount of shipment offerings. Dealer buying was light.

Crepe Rubber

The following prices ruled in New York on February 11:

Dealers' selling prices:	Cents per lb.
Sole crepe, standard grade 'A'	48 (48)
Thick crepe	32¼ (32)

AMSTERDAM

The Amsterdam rubber market ruled as follows on February 2:

Guilders per kilo

No. 1 RMA	Feb. 16	Previous
February ..	2.43½	2.46
March	2.44	2.46½
April	2.44	2.47
May	2.44½	2.47½
June	2.45½	2.48½
April/June ..	2.44½	2.47
July	2.47½	2.50
August	2.47½	2.50
September ..	2.48	2.50

Sales: 45. Tendency: Quiet.

DJAKARTA

Values tended to ease on lack of buying support on February 16. The close was quiet. Export certificates were quoted at 332 paid/buyer.

Rupiahs per kilo

	Feb. 16	Prev.
Spot No. 1 Priok ..	22.10b	22.30b
Spot No. 2 Priok ..	21.10b	21.25b
Spot No. 3 Priok ..	19.90b	20.00b
No. 1 fine pale crepe ..	20.00b	20.25b

Tendency: Quiet.

CEYLON

No. 1 RSS

The price for No. 1 RSS, spot, at Colombo on February 16 was 105p (104) Ceylon cents per lb.

RABRM SYMPOSIUM

'MILLROOMS, MASTICATION AND MIXING'

A THREE-DAY symposium for technologists and others concerned with processing natural and synthetic rubbers, will be held at the Shropshire Adult College, Attingham Park, Atcham, Shrewsbury, by courtesy of the Warden, on Monday April 20 to Thursday April 23 1959. Only RABRM members are eligible to attend.

The provisional programme is as follows: Monday April 20, 7.15 p.m., assemble at Attingham Park for dinner. 8.15 p.m., informal discussion lecture. This will be on an astronomical subject and given by A. L. Soden, B.Sc., Fellow of the British Interplanetary Society.

Tuesday April 21, 9.30 a.m., introduction to symposium and lecture by W. F. Watson, Ph.D., D.Sc., Director of Research, RABRM, 'The Theory of Mastication.' 11.20 a.m., 'Mastication Using Peptizers: Roll Mills and Small Mixers,' by J. R. Pyne, A.I.R.I. 3.45 p.m., 'Millroom and Drugroom Arrangement,' by T. J. Daniel, B.Sc., Grad.Inst.P. 6 p.m., 'Mastication in Larger Internal Mixers,' by W. C. Wake, M.Sc., Ph.D., F.R.I.C.

Wednesday April 22, 9.30 a.m., 'The Mechanism of Mixing on Roll Mills,' by G. N. Welding, M.A., B.Sc., A.R.I.C., A.P.I., Reader in Polymer Science, National College of Rubber Technology. 11.20 a.m., 'Internal Mixers, One and Two Stage Mixing,' by T. J. Daniel. 2.15 p.m., 'Productivity and Investment,' by W. C. Wake. 3.45 p.m., 'The Importance of Dispersion and Its Estimation,' discussion lecture led by C. H. Leigh - Dugmore, B.Sc., A.Inst.P., A.I.R.I., Dunlop Research Centre.

Thursday April 23, 9.45 a.m., RABRM Laboratories, Shawbury. 10.15 a.m., demonstrations of the measurement of carbon black dispersion, rapid plastimetry for the millroom, and the use of peptizers on roll mills.

Ankerwerk Machines

Ankerwerk Gebr. Goller of Nürnberg, manufacturers of injection moulding machines, announce that they are making a change in their UK representation. The new sole agents are Hamilton Machinery Sales Ltd., 32 Buckingham Palace Road, London, S.W.1.

Industry INTELLIGENCE

Technical Data

Chemical Resistance of Polyester Resin Laminates and Casts

Laminates and casts of Cellobond polyester resins reinforced with glass fibre find application in the chemical and other industries where a chemically-resistant material is required. Information on the chemical resistance of these resins is given in Technical Note No. P.202, issued by British Resin Products Ltd., Devonshire House, Piccadilly, London, W.1.

Specimens of laminates and casts of three grades of Cellobond polyester resins, namely A.250, A.2623 and A.2660, were immersed in various chemicals, oils and solvents for 30 days at room temperature. The specimens were tested for flexural strength before and after immersion and the percentage reduction in flexural strength as a result of immersion is reported. The resins have good resistance to many inorganic and organic acids, to dilute solutions of caustic alkali, to oils and plasticizers and to many solvents. They are not suitable for use with the more concentrated oxidizing acids, strong alkalis and chlorinated solvents such as chloroform and trichlorethylene.

Synthetic Rubber—Cork Cellular Compounds

Two recent Polysar Technical Reports, both by W. J. Abrams, relate to synthetic rubber compounds containing cork.

Report No. 7:10B gives a recipe for a sponge compound for gasketing material based on Polysar Butyl 400, containing 20 phr. of cork dust and 100 phr. of talc. The vulcanized product has a density of 0.8gm./cc. but this can be varied somewhat by varying the mould loading. When the gasketing material is to be used in contact with organic finishes which must not be stained, the use of Polysar XPRD-759 in place of Polysar Butyl 400 is recommended.

The second report, No. 7:10C, contains a recipe for oil-resistant cellular material for products such as matting, flooring and shoe soling. The compound is based on Polysar Krynac 803 (a nitrile rubber) and contains 150 phr. of granulated cork and 52 phr. of clay. The vulcanized product has a density of 0.55gm./cc. but this can be varied by varying the mould loading or altering the recipe in regard to the quantity of cork, clay, plasticizer or blowing agent.

Pelleted Rubber Accelerators

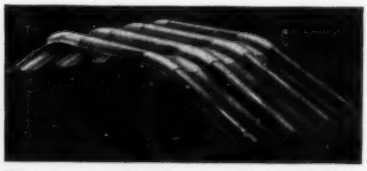
Pelleted vulcanization accelerators have the advantage over the powdered form of absence of dust and greater accuracy in weighing out for incorporation in rubber. They disperse readily on (a) the open mill at a mixing temperature of 70—80°C., which is commonly achieved in the factory, as well as in (b) the internal mixer under normal factory conditions. Results of a comparison of nine pelleted accelerators with their powdered form are reported in Technical Service Bulletin No. 14A/1, issued by Monsanto Chemicals Ltd. (Plastics Division), Monsanto House, 10-18 Victoria Street, London, S.W.1.

The accelerators used were Thiofide (MBTS), Thiotax (MBT), Bantex, DPG, Thiurad (TMT), Mono Thiurad, Ethyl Thiurad, Santocure and Santocure NS. The mixes used were based on natural rubber and were loaded with whiting (100 phr.) for the first four accelerators, blanc fixe (50 phr.) for the next three accelerators, and HAF black (50 phr.) for the last two accelerators. Test results are given for tensile strength, modulus and elongation at break of the vulcanizates, as well as hardness or most of the mixes. The results showed no significant difference between the activity of the pelleted and powdered forms of any of the accelerators.

Machines, Materials and Equipment

Plastics Sheets and Roof Lights

Four new products announced by U.A.M. Plastics Ltd., Tolpits Lane, Watford, Herts, include a special grade of Unilux sheeting for interior use and three new forms of roof light, one of which is insulated. So far Unilux has been available in Grades A and FR, the latter being fire retardant and covered by Joint Fire Research Board test report No. FROSI 1095. The new Grade FR



The new double cranked Unilux translucent roof light for use as a crown unit with Universal Handcraft and Cambridge self-supporting asbestos cement buildings

(Int) is intended for interior use in conditions where a greater degree of self-extinguishing is required. It is at present made only in opaque colours, but a translucent form is being developed. It is available in 27 different profiles, prices being the same as for Grade FR.

The new Unilux insulated decking light is designed for use with Universal asbestos cement insulated hollow or battened decking. It is a translucent cavity unit with a light transmission of over 70% and a calculated 'U' value of 0.5. Dimensions of the standard unit are 2ft. 7½in. by 9ft. 10½in. The standard unit costs £24 10s. in Grade A Unilux, £28 10s. in Grade FR. The Unilux dome light is fluted in form, the dome itself being translucent and the curbs opaque. Two types are available, one with plain curbs, the other with curbs incorporating a form of ventilator designed to remove such condensation as may form on the underside of the dome. Standard dimensions are 24in. square and 48in. square, though other sizes can be produced to specification. Prices range from £7 10s. A double-cranked Unilux sheet has been devised to provide natural lighting in Universal Handcraft and Cambridge type self-supporting asbestos cement buildings. It can be used only as a crown unit, and complete rings of asbestos cement cranked units are necessary on both sides of each ring containing the Unilux unit. Prices for the unit are £14 for Grade A, and £16 for Grade FR.

A new Unilux technical catalogue is now available. Copies can be obtained from the U.A.M. Group Advisory Service, Tolpits, Watford, Herts (Telephone: Watford 34551).

Fire Alarm

Warning of both slowly and quickly developing fires is given by the Fidela automatic fire alarm made by Associated Fire Alarms Ltd., Claremont Road, London, E.17. The alarm, which is housed in a Bakelite case, utilizes a temperature sensitive strip mounted on a base with a different coefficient of expansion; in the case of a slow warm-up contact is made when the temperature reaches 160°F. When the heating is quicker the base does not have time to attain temperature and so contact is made earlier.

Publications Received

Rock Wool Insulation

The second brochure dealing with 'Rocksil' rock wool insulation products, just issued by the manufacturers, The Cape Asbestos Co. Ltd., concerns the material's applications in marine engineering. This 24-page illustrated publication gives full specification details of 11 products including the new 'Rocksil Marine Board' designed for comfort and sound insulation on ships' sides, bulkheads, deckheads and accommodation partitions.

Methods of application, illustrated with technical drawings, are recommended for a variety of applications.

Future Events

INSTITUTION OF THE RUBBER INDUSTRY

Leicester Section.—Monday March 2 at the Grand Hotel, Leicester, at 6.45 p.m. 'Recent Developments in the Use of Plastics and Rubbers in the Boot and Shoe Industry,' by A. J. Bunten, M.A., SATRA. Joint meeting with the Plastics Institute.

North-Eastern Section. — Monday March 2 at the Eldon Grill, Grey Street, Newcastle, at 7 p.m. 'Method Study and Work Measurement,' by S. F. McKee, Dunlop Rubber Co. Ltd.

Preston Section.—Monday March 2 at the Bull and Royal Hotel, Church Street, Preston, at 7.15 p.m. 'Safety in the Rubber Industry,' by J. Stopforth, A.I.R.I., Leyland and Birmingham Rubber Co. Ltd.

PLASTICS INSTITUTE

Midlands Section.—Monday March 2 at the Grand Hotel, Leicester, at 6.45 p.m. 'Recent Developments in the Use of Plastics and Rubbers in the Boot and Shoe Industry,' by A. J. Bunten, M.A., SATRA. Joint meeting with the Institution of the Rubber Industry.

COUNTY COURT JUDGMENTS

NOTE.—These Judgments which are supplied from the Registry of County Court Judgments, Lord Chancellor's Department, 3 Dean's Yard, London, S.W.1, are not necessarily for debt, and some may have since been satisfied. They may be for damages or otherwise, they may relate to actions bona fide contested between the parties, or they may be against defendants liable in a representative capacity and not personally; but no distinction is made on the register. A judgment does not imply inability to pay. Judgments are not returned to the Registry if satisfied in Court Books within twenty-one days.

J. B. WILSON (Male), 6 Gascoigne Road, Barking, Essex, tyre dealer, Ilford. £17 5s., November 17 1958.

FIBRIN PLASTICS LTD., Dobcross, Yorks. Oldham. £17 18s. 6d., November 26 1958.

VERNON JACKSON (T/A HUDDERSFIELD PLASTICS), 4 Victoria Road, Elland, York. Hyde. £14 5s. 8d., October 28 1958.

RAYMOND MOORE, 436a London Road, Ashford, Middlesex, self-employed tyre dealer, Slough. £26 13s. 6d. November 21 1958.

MERSEYSIDE PLASTICS, 11 Burwen Drive, Liverpool, 9, Lancaster. Bradford, £55 18s. 4d. December 12, 1958.

RUBBER ASBESTOS AND FLOORINGS LTD., R/O Bridge End Chambers, 3 Bridge End, Leeds, Yorks. Brighton, £25 17s. 10d. November 26 1958.

Terylene Patents

The hearing of Calico Printers' Association's case for the extension of its Terylene patents, fixed for February 25, is expected to be held in private.

TRADE MARKS

Objections to the registration of any of the undermentioned applications may be lodged with the Comptroller-General of Patents, Designs and Trade Marks at the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, within one month of the date mentioned. The objections must be stated on Trade Marks Form No. 7, cost £2, obtainable through any money order office. The extracts—from "The Trade Marks Journal"—given below are reproduced by permission of the Controller of H.M. Stationery Office.

LOCKOBLOX (B774,340) For toy building blocks. By Shipton Plastics Ltd., Ferndown, Northwood Hills, Middlesex. To be associated with No. B774,339 (4200, 50) and another. (Class 28; January 7 1959.)

RILEX PLAY HARD (779,077) For boots, shoes, slippers and sandals. By Rubber Improvement Ltd., Rilex Works, London Road, Wellingborough, Northamptonshire. (Class 25; January 7 1959.)

CYDAC (782,551) For chemical products used in industry as accelerators for the vulcanization of rubber. By the American Cyanamid Co., 30 Rockefeller Plaza, City and State of New York, United States. Address for service is c/o Stevens, Langner, Parry and Rollinson, 5 to 9 Quality Court, Chancery Lane, London, W.C.2. (Class 1; January 14 1959).

BALLERINA (781,943) For pocket wallets, purses, pocket cases, money wallets; and cases for holding manicure sets (sold empty); all the aforesaid goods being made of plastics in imitation of leather. By Harold Wesley Ltd., Harley Mills, Acton Lane, Harlesden, London, N.W.10. (Class 18; January 14 1959.)

DIEHARD (780,683) For pneumatic tyres for vehicles. By Vaculug Traction Tyres Ltd., Site 5, Gonerby Hill Foot, Grantham, Lincolnshire. (Class 12; January 21 1959.)

HOLMSUND NYLETTER

(757,882) For tiles made of plastics. By Svenska Cellulosa Aktiebolaget, Kopmangatan 10, Sundsvall, Sweden. Address for service is c/o Boult, Wade and Tennant, 112 Hatton Garden, London, E.C.1. To be associated with No. B716,840 (3953, 227). (Class 19; January 21 1959.)

TERMOBOX (772,537) For containers included in Class 16 made principally of paper or of paper board or of combinations of paper or of paper board with metallic foil and films of thermoplastics. By Organisation Internationale du Thermosac S.C., 71 Forelstraat, Ghent, Belgium. Address for service is c/o Bromhead and Co., St. Paul's Chambers, 19-23 Ludgate Hill, London, E.C.4. (Class 16; January 21 1959.)

RHOLENE (779,177) For plastics in the form of sheets, blocks, rods tubes and of shaped sections, all for use in manufactures and included in Class 17. By Société des Usines Chimiques Rhone-Poulenc, 21 Rue Jean-Goujon, Paris 8e, France. Address for service is c/o W. Symmons and Co., 329 High Holborn, London, W.C.1. (Class 17; January 21 1959.)

HELLFAX (779,414) Plastics in the form of foils and included in Class 7. Dr.-Ing. Rudolf Hell, Grenzstrasse 1-5, Kiel-Dietrichsdorf, Germany. Address for service is c/o Baron and Warren, 16 Kensington Square, London, W.8. (Class 17; January 21 1959.)

Increases of Capital

Harpenden (Selangor) Rubber Co. Ltd. (162,234), 20 Eastcheap, London, E.C.3.—Increased by £350,000 in £1 shares, beyond the registered reduced capital of £150,000.

Highlands and Lowlands Para Rubber Co. Ltd. (89,042), 10-15 Mincing Lane, London, E.C.3. — Increased by £500,000 in 2s. ordinary shares, beyond the registered capital of £1,000,000.

Moulding Powders Ltd. (562,041), Lamberhead Industrial Estate, Pemberton, Wigan.—Increased by £1,000 in £1 ordinary shares, beyond the registered capital of £9,000.

Latest Wills

Mr Harry Leslie Fifield, of 26 Larch Road, Kettering, Northants., sales representative for Itshide Rubber Co. Ltd., Petersfield, Hants., who died on November 21, left £4,455 gross, £4,246 net. (Duty paid £84.)

Mr Edward Addis, of Woodside, Orton Lane, Lower Penn, Wolverhampton, manager of the Mileage Division at the Goodyear Tyre and Rubber Co. Ltd., who died on September 7, left £9,861 gross, £9,379 net. (Duty paid £366.)

Mr Thomas Alexander Ball, of Spero Nursing Home, Salisbury, Wilts., formerly of Binscombe Hanger, Mark Way, Godalming, Surrey, former rubber planter, who died on November 6, left £8,576 gross, £8,502 net. (Duty paid £340.)

Tyres made with special-formula rubber to resist chronic exposure to radiation have been developed by the B. F. Goodrich Company for use on nuclear-powered aircraft of the future, it has been announced in the US.

NEW COMPANIES

Banbury Flooring Co. Ltd., (618,281). — January 6. Capital: £1,000 in £1 shares. To carry on the business of layers of tile, block, stone, granolithic marble, terrazzo, rubber and parquet floorings, etc. The directors are: Norman Witcomb and Irene B. Witcomb, both of Buddleia House, Epwell, Banbury, Oxon. Regd. office: Buddleia House, Epwell, Banbury, Oxon.

Seelwell (Polythene) Ltd. (618,397). —January 7. Capital: £100 in £1 shares. To carry on the business of manufacturers, factors, wholesalers, retailers, importers of and exporters of and dealers in all kinds of plastics, rubber, leather, vulcanite, ebonite, etc. The subscribers, each with one share, are: Reginald Large, F.A.C.C.A.; and Jenniffer M. Haines, both of Museum Street, London, W.C.1. The first directors are not named. Regd. offices: 29 Museum Street, London, W.C.1.

Poly Plastics Ltd. (618,479).— January 8. Capital: £1,000 in £1 shares. To carry on the business of manufacturers, importers and exporters, wholesalers and retailers, moulders and fabricators of and dealers in plastic substances, powders and materials, etc. The subscribers (each with one share) are: David H. Miller, hardware merchant, and Harold E. Miller, hardware merchant, both of 77 Bickenhall Mansions, Baker Street, London, W.1. David H. Miller is the first director. Regd. office: 128 Baker Street, London, W.1.

Ink Products Ltd. (618,519).— January 8. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in colours, inks, glazes for use in organic and inorganic plastics, ceramics, paints, oils, enamels, etc. The directors are: George A. Hirst, 416 Norristhorpe Lane, Heckmondwike; Clarence C. Hirst, 109 Poplar Grove, Bradford, 7; Donald Keech, Leonard J. Watkinson and Kenneth Hirst. Regd. office: Church Street, Leeds, 10.

Yam Seng Rubber Co. Ltd. (F.4,758). — January 8 1959 pursuant to Section 407 of the Companies Act 1948. Nominal Capital: £85,000. Registered in Eire in July 1895. British address: 76 New Cavendish Street, London, W.1., where Percy Phillips is authorized to accept service of process and notices on behalf of the company. The directors are: Bertram W. Meaden, 11 Clareville Court, Clareville Grove, London, S.W.7, director of Contanglo Banking and Trading Co. Ltd.; Reginald A. Cacutt, 215 Watford Way, London, N.W.4.

Pritex (Plastics) Ltd. (618,659).— January 9. Capital: £100 in £1 shares. To carry on the business of dealers in and factors and manufacturers of flexible or rigid synthetic foam, etc. The directors are: William F. Milton, Woodram Mead, Corfe, Taunton; George M. Price, Oakfield, Pyles Thorne, Wellington, Somerset.

Secol Ltd. (618,710).—January 12. Capital: £100 in £1 shares. To carry on the business of manufacturers of and dealers in plastic materials, etc. The permanent directors are: Bertram E. C. Green and Jewel G. Lang, both of 21 Littleton Road, Harrow; directors of Unique Designs Ltd. Regd. office: 44a Station Road, North Harrow.

Solution to RJIP Crossword

(See page 292 this issue)

ACROSS.—1, Platen press. 7, Patent. 8, India. 9, Hen. 12, Troll. 13, Nipper. 15, Trends. 16, Lit up. 17, Elm. 20, Their. 21, Acidic. 22, Deteriorate.

DOWN.—1, Play. 2, Apex. 3, Either. 4, Painter. 5, End-to-end. 6, Seamless. 10, Inflated. 11, Spot test. 14, Emperor. 15, Tomato. 18, Pisa. 19, Lime.

PATENT LIST

Printed copies of the Specifications in the following list can be obtained from the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2, price 3s. 6d., including postage, but about six weeks after the date of this publication will usually elapse before they come available. Orders with remittance may be sent in advance to the Patent Office, and will be fulfilled immediately the Specifications are published.

COMPLETE SPECIFICATIONS ACCEPTED

Open to public inspection on February 25 1959

Clyde Rubber Works Co. Ltd., and D. M. Hannah. Pad for use with flat-bottomed rails. 809,659.

Esso Research and Engineering Co. Polyethylene compositions. 809,484.

Badische Anilin- and Soda-Fabrik A.G. Dyeing of linear structures of polyacrylonitrile and its copolymers. 809,382.

Universal Plastics Ltd. Mirror. 809,567.

B. F. Goodrich Co. Polymer solutions. 809,346.

United States Rubber Co. Collapsible containers. 809,569.

Vereinigte Glanzstoff - Fabriken A.G. Process for the production of polyamide slivers. 809,478.

Deutsche Gold und Silberscheideanstalt Vorm Roessler. Hardener paste for the polymerization of organic compounds. 809,559.

E. I. du Pont de Nemours and Co. Process of coating polymeric substrates. 809,558.

Kodak Ltd. Polymers and photographic emulsions containing them. 809,340.

Vereinigte Glanzstoff-Fabriken A.G. Process for dyeing polyolefine textile materials. 809,495.

Firestone Tire and Rubber Co. Tyre and rim combination. 809,575.

Midland Silicones Ltd. Organosilicon foams. 809,497.

Dunlop Rubber Co. Ltd. Composite products of rubber and textile yarns. 809,322.

Rubber Journal and International Plastics CLASSIFIED ADVERTISEMENTS

APPOINTMENTS VACANT

6d. a word, Minimum 10/- Box 2/-

AERIALITE LTD. have a vacancy for a chief chemist with extensive experience in the research and development of materials for plastic and rubber cables. The man appointed will control the laboratory and an established process control section. Applicants should be qualified to A.I.R.I. or equivalent standard, and should give all relevant details in writing to:—Works Executive Director, Aerialite Ltd., Castle Works, Stalybridge, Cheshire. (264)

COLOUR chemist or experienced colour matcher required for PVC manufacturer of fine sheeting, printing and handbag materials. Good salary and prospects, pension scheme in operation.—Box 276. (276)

APPOINTMENTS VACANT (continued)

A VACANCY occurs for a young rubber technologist of L.I.R.I. standard. Experience in footwear compound would be an advantage. This is an opening with good prospects. Applications, which will be treated with confidence, should be addressed to:—Sam Kay Rubber Co., Ltd., Hope Mill, Portwood Place, Stockport. (250)

ENGINEER with knowledge of rubber machinery, both use and design, preferably under 35, but not essential. Good prospects with expanding firm building rubber machinery in the South. State age, experience, qualifications and salary required. —Box 245. (245)